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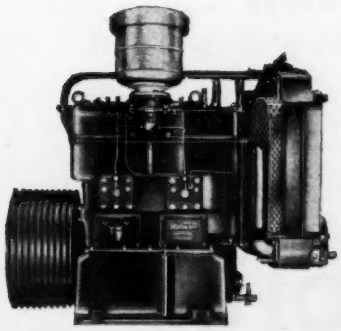

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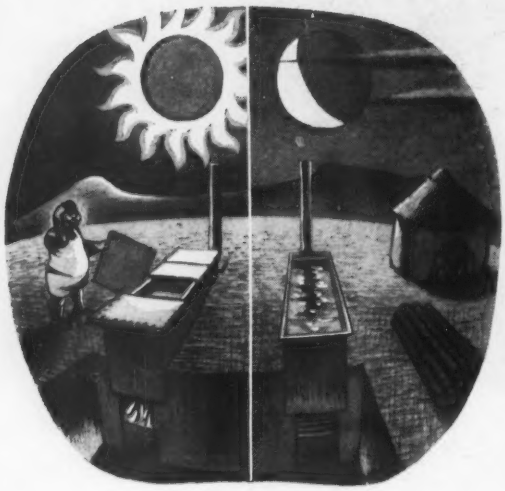

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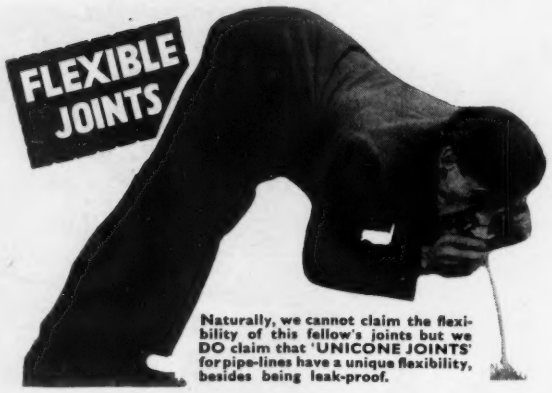
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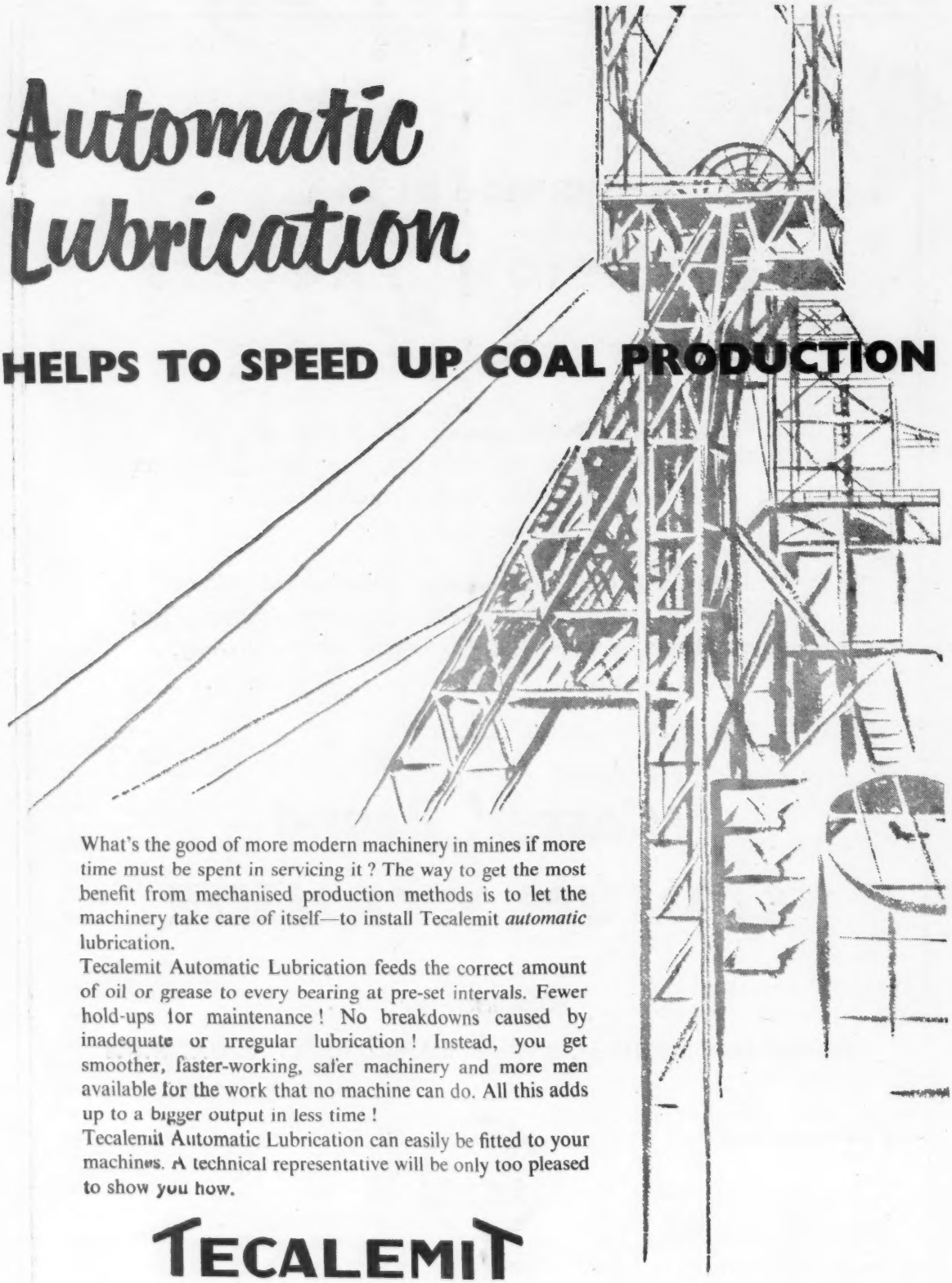

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NOTES AND COMMENTS

Mr. Oppenheimer Looks into the Future

Mr. Harry Oppenheimer in a speech to the South African House of Assembly earlier this week forecast that in four years' time the Union's total production of gold and uranium would be worth about £100,000,000 a year more than at present. This estimate, he said, was based on the assumption that the gold mining industry would be supplied with all the native labour it required. Furthermore, he declared that in a short time South African currency might be expected to become just as hard as the dollar.

While everyone would like to see Mr. Oppenheimer's prediction come true, there will, no doubt, be many who take a less sanguine view of the immediate future for the South African gold and uranium mining industry. Labour shortages have, of course, been one of the principal factors in setting a limit on the productive capacity of the industry but equally, power shortages have played their part in limiting output by requiring companies to revise their production time tables, as well as compelling them to work below peak capacity. On the other hand, the labour supply position has recently shown a big improvement, the January Rand labour figures revealing a labour force of 286,795 against 274,094 in December and 274,945 a year ago. Indeed, particular significance can be attached to the January total as it is the highest recorded since July, 1952, and surpasses by a small margin the peak figure reached last March which is customarily regarded as the peak month of the year. Meanwhile, plans to increase power supplies to the mines are making good progress.

Implicit, perhaps, in Mr. Oppenheimer's statement is that the political scene will remain favourable and that additional labour force will be forthcoming from other sources. Perhaps, too, Mr. Oppenheimer had in mind an upward revision of the gold price, but on these points the agency message reporting the speech is silent.

Mr. Oppenheimer's statement, however, that in the near future South African sterling would be just as hard as the dollar stands in need of some explanation and it is indeed a pity that the full report of his speech is not available, as to treat this assertion out of its context may lead to a number of hastily drawn conclusions. In any event, it is hardly likely he meant that South Africa would completely sever its connection with the sterling area and establish her own exchange rates vis-a-vis the dollar. Yet it is worthwhile pointing out that the Union does not participate fully in the currency pooling arrangements of the sterling area so that it could conceivably break away to establish its own exchange regulations without too much difficulty and inconvenience to the other members. At this distance it would appear more probable he meant that with a greatly expanded uranium and gold production the Union would, in a short time, be in a position to draw on its gold reserves to finance its international trade to a much greater extent than ever before.

The Urgency of the Kafue Scheme

The reasons why the Kafue Hydro-Electric Scheme must take precedence over the Kariba Scheme, and its vital importance to the Federation's economy, were recently explained by Mr. R. A. Nicholson, Economic Secretary of Northern Rhodesia.

Of the two schemes, he declared, only Kafue could be financed and completed in time to meet the crisis in the Copperbelt's power needs which could not be met in any other way. Present losses to the copper mines and to the country's revenue through existing power shortages amounted to approximately £20,000,000 and £9,000,000 respectively. The Kafue project, said Mr. Nicholson, was not only vital for filling the Copperbelt's power gap which would widen crucially in the early 1960's, and for meeting the rapidly increasing needs of the Rhodesias in general, but its completion would have a great effect on world opinion. Moreover, the presence of this scheme would facilitate the obtaining of more capital for further hydro-electric development, for which the need was very great, and for all other forms of industrial development.

Outlining the scheme, Mr. Nicholson said it would exploit the fall in the Kafue River, along the 20 miles of

gorge between where the railway crossed the river and where the Kafue emerged from the escarpment into the Zambesi. The fall to be used was some 1,800 ft. and power would be developed in two stations, each using half the fall, and producing about 258 megawatts between them. The flow in this river varied from 75,000 cusecs down to 600 or 700 cusecs at the end of the dry season, so the capacity of the generators would be limited by the amount of storage obtainable above the dam. However, investigations could be carried out to see whether it would be possible to obtain greater storage capacity up the river above the flats. If this was possible, then the capacity of the scheme would be increased considerably.

Since more than a third of the Federation's total revenue was derived from the copper industry it was obvious, Mr. Nicholson said, how vital it was that the industry should receive all the power it required.

With an extra 50 MW. becoming available from the Belgian Congo, the Copperbelt's total effective generating capacity in 1957 would be 228 MW., while the estimated simultaneous peak load would rise to 199 MW. These peak loads, he said, would continue to increase but from 1959 onwards power output would fall away owing to obsolescence of the thermal plant. By the end of 1962 there would be a deficit of 37 MW., or about one sixth of the total requirements. The agreement under which the Belgian Congo would supply power extended only until 1967.

Unless, therefore, Kafue was commissioned in 1960 the copper mines would again have to face restricted output. In addition, the gap between world copper prices and the cost of production might well narrow from both ends. Accordingly, anything that could be done to cut the cost of production was important to the economy of the Federation.

In round figures and on the assumption that the scheme was going to produce 247 MW. delivered north and south—a figure which may well be bettered—this would involve a saving, he said, of 1,000,000 tons of coal per year and of something in the region of 1,500,000 train miles per year in its distribution.

The decision to go ahead with the Kafue scheme in preference to the Kariba Gorge scheme was made on the grounds of the time factor and the practicability in the present circumstances of raising the capital sums required. Both schemes would, of course, be necessary in time, but whereas the Kafue project, producing 247 MW. would cost about £30,000,000, the first stage of the Kariba scheme, producing 380 MW. would, at present prices, cost about £55,000,000. The second stage, producing 900 MW., would probably exceed £100,000,000. From the engineering point of view, he said, it would be another two years before work on the Kariba scheme could even begin as further technical investigations and designing were necessary. The earliest date of the completion of the first stage of this scheme would, therefore, be three or four years too late to fill the Copperbelt power gap

U.K. Steel Industry's Progress

Two publications issued during the past week by the British Iron and Steel Federation throw new light on the steady progress of the industry towards the reduction of the costs of production by the unremitting pursuit of increased efficiency.

In one brochure, appropriately entitled "The Immortality of Steel," is told the full story of the success of the National Scrap Drive which by harvesting an extra 1,500,000 tons of scrap in three years, made possible the attainment of a record output of steel, whilst the monthly bulletin of the Federation describes in detail the tremendous advances which have been made in the provision, transport and handling of the ever increasing tonnages of foreign ore required by British blast furnaces.

In the United States there has just been launched a huge ore carrier with a dead weight capacity of 60,000 tons. Vessels of such dimensions could not be used at the shallow ports whence the bulk of Britain's ore supplies are drawn. But the multi-purpose cargo ships which used to be employed in the transport of ore are no longer available in the required numbers and a fleet of specially designed ore carriers with a total annual carrying capacity of 2,250,000 tons is being built. The turn-round of these and other ore carriers has also been speeded up by the installation of modern discharging facilities at British ports and since 1949 it is estimated that the daily average rate of discharge has been raised by 30 per cent.

The danger is that these substantial economies will be largely if not wholly offset by the impending rise of 10 per cent in British rail freight charges which it has been stated will add 9s. per ton to the cost of ingot production. Whether this will involve an awkward revision of the fixed home prices of iron and steel is not yet known. It is a matter which must ultimately be decided by the Iron and Steel Board who are now engaged in a detailed examination of production costs. But there can be no shadow of doubt that a rise in steel prices at this juncture would be most inopportune.

U.S. Expansion Programme for Titanium

The formulation of vast projects for the production of titanium are now appearing in the United States with the conclusion of the hearings by Senator Malone before the Senate Internal Sub-Committee on Domestic Ores of which he is chairman. With the assurance of support by key Government officials, from a present output of about 3,000 tons a year it is planned to raise capacity to 37,500 s.tons in 1956. Senator Malone has put the eventual consumption, if the metal were available at reasonable costs, at not less than 150,000 s.tons annually.

Earlier estimates of defence requirements were some 35,000 s.tons, subsequently reduced to 22,000, but these estimates are now described as unrealistic, in view of the new types of planes being designed. Mr. R. P. Hurley, chairman of the Curtiss Wright Aircraft Corporation Board, said that if the United States were to retain leadership in the air they must have titanium, and he has indicated that his company intend to set up facilities for the production of titanium metal at Buffalo. The reason for this sensational estimate of future supply has been the extraordinarily rapid development in jet plane design, with speeds up to 3,000 miles per hour now being envisaged. Titanium alone can resist such temperatures as flight at two or three times the speed of sound would generate.

The General Services Administration recently announced an agreement with Du Ponts to begin design and engineering studies looking towards the erection of a plant with an annual capacity of 7,000/8,000 s.tons a year, and was prepared to spend up to $35,000,000 on the project. The company already has a contract for the production of 13,500 s.tons over five years. Other existing contracts are one with a Titanium Metals Corporation of America for 18,000 s.tons over a five-year period, and with Cramet Inc. for 6,000 s.tons a year. The Curtiss Wright Aircraft Corporation told Senator Malone that they believed they could be in a position to produce 500 s.tons of metal monthly within two years. Other firms are, it is understood, to receive contracts in the near future. No information has appeared as to the processes to be employed which would realize the hopes of much lower cost production. Titanium Metals Corporation has announced price reductions averaging 12 per cent for pure metal sheet and plate which is the first significant cut in prices and reflects rapidly expanding output and improved manufacturing techniques.

The Senatorial Committee was told that in Russia and Japan great attention was being paid to the subject of titanium production. In Japan it is hoped to produce 1,18. tonnes of titanium in the current year almost entirely for export.

Existence of Gold in Ceylon in Doubt

That gold exists in commercially payable deposits in Ceylon was recently announced by Dr. K. Kulartnam, Head of the Department of Geography in the University of Ceylon and a member of a panel of consultants of the American Institute of Mining and Metallurgical Engineers, and was the subject of comment in these columns in our issue of February 5.

Dr. Kulartnam's declaration, it will be recalled, arose following encouraging assay results yielded from quartz specimens, taken from districts in Central Ceylon, which prompted him to advocate the establishment of a Gold Development Corporation to own and work the gold resources of the island on behalf of the Government, and also to urge an immediate geological survey of the country's gold occurrences.

Our Indian correspondent, in a despatch received earlier this week, now reports, however, that Dr. Kulartnam's statement has been challenged by Mr. J. L. D. Fernando, Government Mineralogist.

Mr. Fernando, who is to submit a report in the near future to the Ministry of Industries on the availability of gold deposits in Ceylon, refuted every argument advanced by Dr. Kulartnam and said that the geological evidence available was overwhelmingly against the possibility of there being commercially workable deposits of gold in Ceylon. He also said that the Government carried out periodic surveys for gold in the island and that recently, while investigating the streams and rivers in the Ratnapura District, gold had been found but in such insignificant quantities as to be of no economic consequence.

Meanwhile, no such controversy has arisen with regard to the gold discoveries recently announced in the Republic of India. In fact, the Indian Bureau of Mines has now reported another discovery of gold in a belt extending over some 40 miles in Keonjhar which is currently being prospected in detail. Whether or not Dr. S. Bhatnagar, who made the announcement, was aware of the confusion caused by the two conflicting statements in Ceylon our Indian correspondent did not say, but it is salutary to note that Dr. Bhatnagar views this latest discovery with well merited caution as he said that he hesitated to mention it until it had been established on a definitely scientific and quantitative basis.

Fall in Gold Prices Affects Congo Producers

The recent lowering of the selling price of gold ingots by 700 Belgian francs per kg. to 59,500 Belgian francs per kg. by the Belgian Congo Gold Producers' Co-operative (C.O.N.G.O.R.) may prevent further expansion of the Belgian Congo gold mining industry, writes our Brussels correspondent in a recent despatch.

The present position in the Congo would appear to be that the detrital ores are becoming increasingly worked out although the percentage of gold extracted from hard rock deposits is still increasing. Unfortunately, exploiting these primary deposits requires an expenditure which can only be afforded by the larger companies and our Brussels correspondent writes that the lower price of gold now prevailing may be sufficient to prevent the further capital investment necessary for the continued working of these deposits.

South Africa

(From Our Own Correspondent)

Johannesburg, February 3.

The excellent results announced in the December quarterly reports of the Rand and O.F.S. gold producers are still very much in mind, and while talking points still tend to centre around the series of high individual values attained in the F.S. Geduld-Western Holdings-President Brand area, there is a growing awareness of the importance of the high percentage payability achieved by these companies, particularly because it goes some distance towards countering the suggestion made at one stage that the Reef formation in the Orange Free State might be allied to the "shoot" formation of the Far East Rand, where rich lenses are found interspersed with unpayable sections. While the Basal-Vaal reef horizon has shown a tendency to vary considerably in width it would appear that its gold content varies in inverse ratio to its width so that the narrower the reef the higher the gold values carried, indicating a very high mineralization and thus the in./dwt. values announced reflect a high degree of consistency over a relatively long reef exposure.

In any case, the high values encountered in the initial development work carried out in both shafts at Free State Geduld, in the Western Holdings box-hole, and over a good stretch of the reef at President Brand strongly suggest that there is a highly mineralized formation running throughout these properties. In fact, earlier drilling indicated this possibility, but the actual development results now accomplished seem to remove any doubts that the original results were merely fortuitous.

Although the results announced by Harmony Gold were not spectacular, the work is still largely confined to the ventilation shaft area where drilling did not encounter any significant values. But when the borehole results from the northerly part of the lease area and from those obtained in the Saaiplaas area are taken into consideration there is sufficient evidence to assume that the rich mineralized belt either turns eastwards in the lower section of the President Brand property, or is possibly displaced into the Harmony Saaiplaas area.

IMPORTANCE OF URANIUM

Uranium profits for 1953 before adjustments, which—judging by those made in the case of West Rand Consolidated—can be substantial, amounted to £1,828,000. By itself this figure may not seem impressive, but when it is remembered that the West Rand Consolidated plant is the only one past the teething stage, the prospects for the future are most encouraging. The figure returned for West Rand Consolidated was £686,000 for the whole year but the January monthly mine return, which shows uranium profits and gold profits separately, estimated uranium earnings at £160,000 compared with £142,000 in December. Moreover, the plant at West Rand Consolidated is the smallest plant so far in operation, so that it is not difficult to be optimistic about the future profits of the other scheduled uranium producers.

When all the uranium plants so far listed as scheduled producers are in full operation it has been stated officially that the net profit should be in excess of £30,000,000 per annum. If so, this would not be far short of the present working profit obtained from gold mining, which for 1953 was just below £35,000,000. In any event, the next 12 months should end up with profits from uranium showing a good measure of progress along the road to the target figure of £30,000,000 per year.

SUB-LEVEL CAVING—I

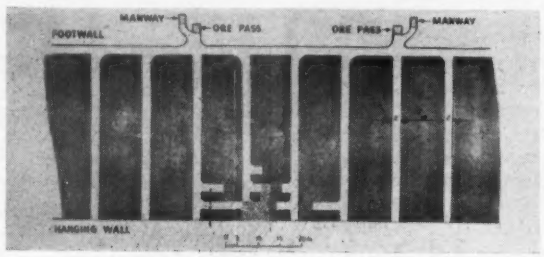
Sub-level Caving at Grängesberg, Sweden

By B. K. LUNDIN

Sub-level caving has been practised on the Grängesberg ore field, Sweden, for nearly fifty years. Originally used for extracting pillars between transversal shrinkage stopes, the practice rapidly became the main mining method. The present practice, called mechanical caving, is the result of an operational method begun in 1944, when, after previous experiments, development work was started according to a new system. The first year in which mining was actually carried out by the new method was 1946, when the original practice of chute caving still dominated owing to the difficulty of altering the development and caving of the slices already begun. The remarks which follow constitute the first instalment of an article by the underground manager at Grängesberg, and the complete article deals with all facets of mechanical caving including mining techniques, geological factors, and economic considerations.

As various consequences of the new system at Grängesberg are perhaps not immediately obvious, a brief account of different aspects of the latest phase of development of the earlier method will be of value. The manways and ore passes were located in the footwall about 3 m. from the ore line. The vertical distance of the main haulage levels was 40 m. and the height of each slice 5 m. From the longitudinal stope along the footwall, cross drifts at a central distance of 12 m., were driven up to the hanging wall. All the drifts were 2 x 2 m. in size, and the pillars between them were thus 10 m. wide. This development work was done by special drifters.

Caving was then undertaken in the pillars from cut-off stopes running along the strike. These stopes were driven so that small pillars, each 2 m. in width, were left on the hanging side. The pillars close to the hanging wall were, however, made 2.5 m. wide. This drifting was undertaken by the sub-level cavers. The slice was opened in the middle of the pillar which was located on the line between two ore pass areas. Here blasting was done up to the superincumbent broken slice level, the ore under the hanging wall being extracted at the same time. The operation then proceeded backwards in both directions to the cross drifts, after which the next cut-off stope was driven in the same way. The remaining 10 m. pillars were broken at full width in only one direction.



Development drifting in chute caving

The caving was thus carried on from the hanging wall to the footwall, although it mainly took place in the longitudinal direction. Three holes were drilled in the roof and two holes in the 2 m. pillar facing the hanging wall, all in the same vertical plane, square to the cut-off stope, in one row. The distance between the rows was about 0.8 m. When two rows had been drilled, a chute was built in the drift immediately outside the rear row. All the holes were charged, the inner row of holes was blasted, and the ore loaded into forward-dumping 1 ton cars. Then the procedure was repeated in the rear row. About 75 per cent of all rock broken during the progress of caving and development drifting could be discharged through the chute.

Technical data and outputs, in round figures, recorded in development drifting and sub-level caving according to this method from 1930 to 1944 are shown as follows :

Development drifting	*Sub-level caving, actual figures* A.	*Sub-level caving, converted* B.
108.400 drift-m.	19.700.00 tons	17.900.000 tons
830.800 kg. of dyn.	2.390.000 kg. dyn.	1.560.000 kg. dyn.
195.00 8-hour shifts	855.00 shifts	660.000 shifts
7.7 kg. of dyn. per drift-m.	8.2 t. per kg. dyn.	1.5 t. per kg. dyn.
0.55 drift-m. a shift (incl. loading)	23.0 tons a shift	29.1 tons a shift
1.0 drift-m. a shift (excl. loading)		

The figures for caving in column A opposite include 107.500 drift-m. completed by the slicers. Column B shows the figures obtained when deducting this drifting and basing upon the same technical data as in the development drifting, and when estimating the quantity of rock at 17 tons per drift-m. Thus, the output in chute caving would have been 27 tons a manshift, if all the drifting had been carried out by special forces. In the case of the 15-year period under review, the deviations in single years from the average records are very small. The timber consumption for the same period in connection with caving amounted to 7 cu. ft. per 100 tons of ore.

In the development practice carried out in conjunction with the mechanical sub-level caving the earlier 10 m. pillars are divided through a central cross drift into two smaller pillars, each 4 m. in width. All the drifting is carried out by special crews. For pure ore having length L and width B, i.e., the distance horizontally between the footwall and the hanging wall, it can be easily shown theoretically that the total drift-m. requirement (S) in chute caving is equal to $\frac{L.B.7}{24}$ and (M) in mechanical caving is equal to $\frac{L}{6}(B+4)$. Thus $\frac{M}{S}=\frac{4}{7}\frac{B+4}{B}$, indicating that the ratio is only actuated by the ore width.

The number of drift-m. according to the new system is consequently reduced by 35 per cent when the ore width is 30 m., 39 per cent when it is 60 m., and 40 per cent when it is 90 m., as compared with the earlier system. The cross drifts on a slice level are driven so that they come right under the pillars on the level above. Their size is 1.9 x 2.2 m. height above the upper edge of the rails, and 25 to 30 holes are required at 2.1 m. depth, all holes being parallel with the direction of the drift.

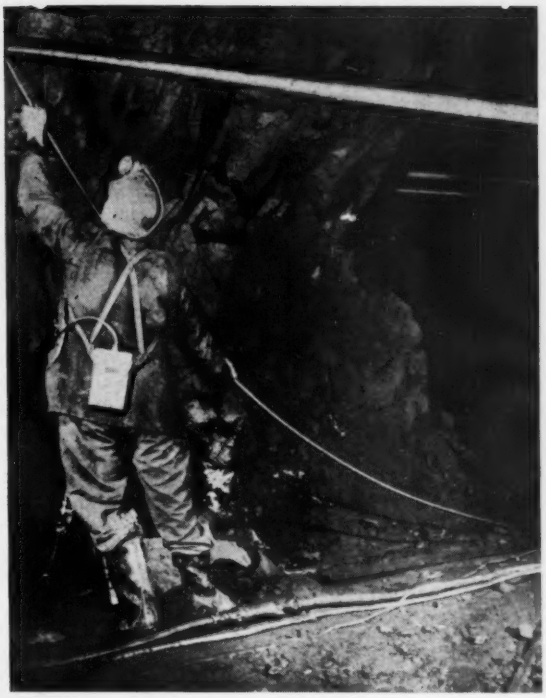
A whole round is completed at one time by the seam or burn cut method, and the advance amounts to 1.9 m. Normally, each drifter requires at least two, preferably three drifts, to avoid being hindered by the loading work. A drift round comprises 35 to 40 tons of rock, therefore a drift loader serves two or three drifters. Drilling is undertaken with RH-655W Atlas drills with pneumatic pushers for 1.3 m. feed length and $\frac{7}{8}$ in. hexagon tungsten carbide tipped steels, 0.8, 1.6 and 2.1 m. in length, with 108 mm. collared shanks. The two shorter types of steel will be replaced by a steel having a length of 1 m. The 2.1 m. long steel has a bit diameter of 32 mm. The explosive used, dynamite containing 29 to 30 per cent nitroglycerine carbon and 4 per cent of aluminium corresponding to dynamite containing 50 per cent of nitroglycerine, is in the form of cartridges, 23.5 mm. in diameter and 320 mm. in length, enabling rapid charging and easy packing.

The track is made of rails 65 mm. in height weighing 10 kg. per m. The rails, 2.5 m. in length, are placed on 4 in. high by 6 in. sleepers having a length of 1.1 m. The central distance between the sleepers is 0.8 m. The track is arranged slightly eccentrically in the drift to give the loader a larger working space. The track has an inclination of 6.7 per 1,000 (1:150) on straights and 10 per 1,000 (1:100) in curves and in the footwall drift. The laying of the rails is checked with water levels, and switches and curves are also laid with great care. In connection with the drift loading, 1.5 m. and 2.5 m. long gates are used. These gates consist of two joined rails placed on their sides so that the wheel flanges run on the webs of the rails. Loading is undertaken with the same kinds of machines and cars as those used in connection with the sub-level caving. Due to the method of blasting rounds, the broken rock collects at the front of the heading, with little throw, resulting in higher loading efficiency.

SLICE EXTRACTION

The extraction of a slice is started at the hanging wall. The drift is stoped out 2 m. in each pillar, and the 3 m. high roof is excavated, after which the operations proceed backwards towards the footwall. Drilling is undertaken in rows at a distance of 1 m. each including seven holes, three roof holes and two holes in each pillar, with HH-656-2MW Atlas rock drills mounted on raising feeds BMT-62A having a feed length of 1 m. The holes are slightly inclined forward. For drilling the pillar holes and the roof holes up to 2.4 m. $\frac{7}{8}$ in. hexagon tungsten carbide drill steels, 0.8, 1.6 and 2.4 m. in length, are used. The deep portions of the roof holes are drilled with special flexible steels of 26 x 12 mm. rectangular section. If they become bent, these steels straighten themselves, leaving no deformation. Like other steels, they are provided with water flushing holes and tungsten carbide bits which have a diameter of 31 mm. on the first length of steel, 3.2 m. Only in a few cases have steels over 4 m. in length been used. Trials with these flat-bar steels were started in March, 1950, but it was not possible to change over completely to this type of drill steel until the autumn of 1952. The reason why ordinary steels cannot be used for the entire hole is that it is desired to keep the working face as nearly vertical as possible—particularly for safety reasons—and thus space is not gained in the 2.2 m. high drift for such long drill steels as are required for the roof holes, normally 3.5 to 4 m. deep. Earlier drilling was undertaken with carbon steels which were bent before being introduced into the holes, and then straightened. When using flat-bar steels, the rotation chuck of the machine is replaced, but this is very quickly done and is often not necessary, as all the holes up to 2.4 m. are first drilled in several rows and the roof holes then started. A simple ski-like device which can glide on the floor of the drift facilitates the withdrawal of the drill steel from the hole and prevents dirt entering the water flushing holes. The same kind of explosive is used as in drifting. All drill steel grinding takes place in four blacksmith's shops underground.

Loader drawpoint in sub-level caving



Flexible flat bar drill steel enables long holes to be drilled from confined working spaces

OPERATIONAL PRACTICE

Sub-level caving is carried on by teams of three men consisting of a driller, working the dayshift, and two loader operators each working shift. During the morning shift break and when the loaders change shifts some loading can also be done by the driller if the drilling work permits. Each team works at least three cross drifts, and the operations there should be carried on so that the front is kept parallel with the hanging wall and the distance from this becomes as equal as possible in all these drifts. If the roof of a drift remains after blasting a row, experience has shown that self-caving is obtained when the operations in an adjacent drift reach the corresponding point. The broken rock is loaded with mine loaders, mainly Atlas IM-30 loaders, into forward-dumping 0.84 cu. m. cars,

weighing 750 kg. The capacity of these cars corresponds to about 2 tons of rock.

The cars are transported to the ore passes by hand. The shut-off devices are arranged so that they facilitate taking the car out of the dumping position. The loading team has jacks available which can be used if a machine or car should run off the rails. Arches and large boulders are mined down and the breaking up of the boulders can therefore mainly be carried out as underhand stoping with Atlas RH-571-1W or -2W drills and ordinary tungsten carbide steels.

The ore passes which were driven before the mechanical sub-level caving was introduced have been proved to be located too close to the ore line to permit convenient transport of the loader and car between drifts on both sides of the pass along the strike. But in places where it has been impossible to arrange direct tracks via a switch, the problem has been occasionally solved by the provision of either traversers, which have been normally locked for one direction of running, or inclined plane turntables which have been placed right on the track. This is a question of great importance in both drift loading and sub-level caving if smooth organization of the work is to be obtained and if efficient utilization of the machines is to be ensured. In some cases auxiliary drifts have even been driven through pillars in the neighbourhood of the footwall drift merely for this purpose.

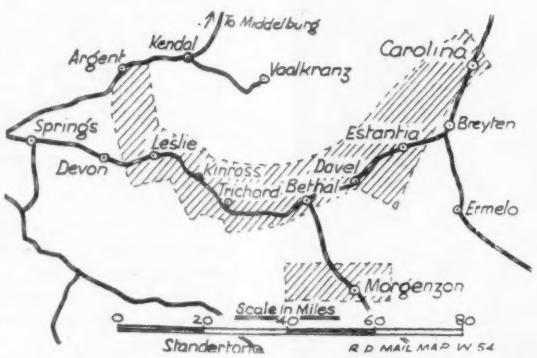
Another inconvenience due to the ore passes having been placed so close to the footwall is that the adjacent part of the ore cannot be taken out by mechanical sub-level caving. As a rule, there is not even sufficient space for the loader. Here it is thus necessary to continue with chute caving. To reduce the consumption of chute timber, two or three slices are often taken out at a time in such places, so that the ore in the upper slice or slices is only blasted down, and discharge takes place on the bottom level. This method, however, increases the risk of dilution. Moreover, if the ore passes are driven further into the footwall the rock fill on the broken levels can be shut off in a more simple way from the passes. Water can also be more efficiently prevented from entering the passes. If the rock is too wet, both the discharge, haulage and dumping on the main haulage level are made more difficult.

The vertical distance between the main haulage levels has now been selected at 100 m. width with a communication level at half this height. To ensure that the position of the manways and ore passes in relation to the ore will not be altered, the side dip ranges from 65 to 75 and the field dip is about the same.

New Mining Area in the Eastern Transvaal

South African mining engineers are turning their attention to the potentialities of the reef formations existing between the small towns of Leslie and Carolina in the Eastern Transvaal area. Some 400,000 morgen of ground have now been taken up under option by virtually all the mining houses, and a major drilling programme is under way. The strike of the reef is estimated to extend over a length of approximately 70 miles, and in a recent letter our South African correspondent reports that it is now virtually impossible to obtain options over any sizeable piece of ground along this extremity.

To date, only one official statement on the possibilities of the Leslie-Carolina area has been made. This appeared in the Annual Report of Union Corporation Limited early last year, and was contained in a statement which pointed out that drilling had yielded "encouraging gold values in the Kimberley Reef within a limited area of ground held under option in the Bethal and adjoining districts." At present 13 boreholes are being put down.



The Leslie-Carolina area, with shaded areas showing where options have been taken up and the possible run of the reef

The history of the development of this potential extension of the Witwatersrand field goes back to 1933, when a company called Far East Rand Areas sank 20 boreholes east of Springs and to the south of the Leslie-Kinross area. These established the existence of the Lower Witwatersrand system, although gold content was extremely low and the ground was subsequently abandoned. These holes had been placed either too far south or west to intersect the Upper Witwatersrand series. In 1947, Anglo-Rand Mining and Finance Corporation Limited and other companies, sank a drill hole approximately 14 miles to the east of Leslie and the south of Bethal. This borehole reached a depth of 1,200 ft. and was stopped in the granite.

On the findings derived from this borehole and from information gained from geophysical surveys, the Union Corporation began taking up options in the area, and subsequently took over the area held by Anglo-Rand and its associated companies. In 1952, Union Corporation Limited registered five new companies for the purpose of undertaking exploratory work in the area, leaving the original company, Capital Exploration, to concentrate on the area where drilling had disclosed "encouraging" values.

Up to this point in the exploration activities, only one company, Bethal Gold Areas, has made an offer of shares to the public. Its prospectus, through its schedule of participating interests, throws considerable light on the various undertakings which are investigating the area. These include Mineral Search of Africa, a subsidiary of Rio Tinto Mines, Central Mining and Investment Corporation Limited, Anglo American Prospecting Company Limited, and Union Corporation. Anglo American and New Union Goldfields have a joint interest with Anglo-Rand, while other mining houses which hold ground under option are Anglo-Transvaal Consolidated, New Consolidated Gold Fields, and General Mining.

According to geological reports, it would seem that the sub-outcrop of the Kimberley Reef roughly follows the Leslie-Carolina railway line, while another occurrence appears to the south of Bethal in the Morgenson area. Apart from the possibility of the Kimberley Reef carrying good gold values, an important consideration is that this horizon is the economic uranium-bearer of the East Rand.

The Diamond Industry in French Equatorial Africa

No overall summary of the diamond industry of French Equatorial Africa has been given since the reports covering 1950 and 1951 were released, and it is believed that the paper entitled *Situation et Perspectives d'Avenir des Exploitations de Diamant en A.E.F.* released early last year by the French Equatorial Africa Information Service constitutes a valuable contribution to previous information. As the paper was released before the 1952 production figures became available, it should be noted that 156,708 carats were produced in that year. The following article is an abridgment of this paper, which appeared in *Mineral Trade Notes, Vol. 37 No. 5*, published by the U.S. Bureau of Mines. Output of the diamond industry of French Equatorial Africa has almost doubled since 1945, although the paper in its complete form comments on the lack of enthusiasm of private capital for investment in Africa, a reference undoubtedly aimed chiefly at French capital.

Production of diamonds in French Equatorial Africa has shown a substantial increase, rising from 2,000 carats in 1936 to 32,000 in 1940 and 56,000 in 1943. In 1945 the output was 83,000 carats, and in 1947 it increased still further, to 107,000 carats. Then, after levelling off at around 120,000 carats in 1948-50, it again rose in 1951 to 147,800 carats. To the end of 1951 total output was around 1,050,000 carats.

This production classes French Equatorial Africa as only a world producer of secondary importance, far behind the Belgian Congo (62 per cent of the world production in weight), South Africa (16 per cent) and Gold Coast (10 per cent). In fact, the 1951 production of French Equatorial Africa constituted only 0.8 per cent, in weight, although it rose to 2 per cent in value of world production in that year. However, within the French Union the country accounted for 60 per cent of the total in 1951, having taken the place as the leading diamond producer that French West Africa held in 1950.

POTENTIAL IMPORTANCE

If the diamond production of French Equatorial Africa is far from attaining an importance equal to that of other neighbouring countries in Africa, it should be pointed out that diamond mining, still a recent development, could increase to a considerable extent. The diamonds, in general, are a fairly good quality and stones are relatively large, with an average of four to five per carat. There is a high percentage of gem diamonds (up to 65 per cent) in certain areas, and also a part of the output from 8 to 20 per cent consists of carbonados, amorphous diamonds for industrial use, of which French Equatorial Africa and Brazil are the only producers.

Up to the present, only detrital deposits are known in French Equatorial Africa and, more precisely, alluvial diamonds, found in alluvials or flats. Nowhere has the problem of the primary origin of diamonds been solved. In Ubangi there is every reason to think that the diamonds come from the conglomerates of the Karroo System (Berberati or Monka Sandstones), as deposits are formed in a manner similar to those of the Lubilash in the Belgian Congo. In Gabon and Moyen Congo, where the discoveries are still relatively recent, the origin of the diamonds still is not known. The exploration seems to be concentrated on the edge of the Chaillu Pre-Cambrian massive, but it has not been proved that this necessarily has a genetic significance.

Western Ubangi Shari is by far the largest producing area of the country and it seems that it will keep this supremacy for a long time. The deposits there are grouped in a relatively small area, in the midst of Nola, Berberati, Carnot, and Gadzi, in the basins of the Mambere and the Lobaye. They are situated mostly within the area of Berberati sandstone, but to the south, towards Nola, several rich flats are found on the basement.

The exploitation there is principally by hand labour, but in the Nola region several plants are completely mechanized and, near Gadzi, another series of workings are partly mechanized (transport of gravel and washing). This region of western Ubangi Shari, where work has been carried out since 1938, can be considered as well known. The reserves actually proved, together with the deposits not yet systematically cubicated could yield double the production immediately. But this is increasing only slowly because of the difficulties encountered by increasing the labour force. In eastern Ubangi Shari, the operations are much more scattered, although all are situated in the administrative area of Kotto-Dar el Kouti.

Extraction of diamonds began in Gabon and in the Moyen-Congo still more recently. The difficulties there are great as the forests are hard to penetrate, and labour problems are difficult. Nevertheless, a centre of exploitation has already been opened up and production is increasing rapidly. From the beginning it has been possible to introduce mechanical washing plants there.

Progress has thus been made, especially in the field of mechanization, and existing plans foresee a rapid development in overall mechanization. Such projects are envisaged for S.O.R.E.D.I.A. in Makongonio (Gabon), Société Minière Intercoloniale at Batouri (West Ubangi), Compagnie Minière de l'Oubangui Oriental (C.M.O.O.) at Nzako (East Ubangi), etc. Mechanization thus is advancing rapidly, and, if it has not yet reached a definite form throughout, the effort in this direction will not be relaxed. Complete mechanization is impossible, however, as it does not appear applicable to deposits with sandstone bedrock. On the other hand, the recent improvement made in the washing equipment can be applied everywhere.

EXPLORATION ACTIVITIES

What is especially interesting for the future and the stability of diamond production in French Equatorial Africa is the effort either envisaged or now in use for the exploitation of large deposits that are untreatable by present methods. In this connection, an experiment now being made by the C.M.O.O. for dredging the canyons of the Komou by gravel pumping, holds the interest of all Ubangi operators. Indeed, if this experiment is successful it will provide a clear and simple solution to the problem of working certain deposits where the bedrock is sandstone. In addition, although undoubtedly a solution will not be achieved for a long time, the C.M.O.O. is occupied with the problem of dredging the Mambere, a large river with a valley containing enormous quantities of alluvials, and borings have shown interesting diamond tenors.

Prospecting of unknown ground tends to enlarge the area at present exploited in west Ubangi. Two areas are now being explored ; first, the valley of the Mambere and the Sangha, towards the south, by the Compagnie Diamantifere et Aurifere de la Haute Sangha, a C.M.O.O. subsidiary ; and second, the valley of the Lobaye, south of Boda, by Union Minière Africaine, a subsidiary of the Société Minière Intercoloniale. These two companies have

already discovered a certain number of favourable areas and have even blocked out some deposits.

In eastern Ubangi since 1948 large general exploration permits have been granted to companies. Within these permits, covering 115,000 square kilometres, a general reconnaissance is being carried out. However, it is outside of this area, south of the sandstone contact, that the most recent discoveries have been made in the Nzako area.

In Gabon and in Moyen Congo, the Société de Rechèrches Diamantiferes et Auriferos (S.O.R.E.D.I.A.), a C.M.O.O. subsidiary, is conducting a reconnaissance along the entire border of the Chaillu Massive, the Bureau Minier de la France d'Outre-Mer has already begun exploration for diamonds in Mayembe, and other operators are interested in the right bank of the Ogooue, upstream from Ndjole. The Makongonio region, Gabon and the Moyen Congo are also centres of interest. In addition to these programmes geological mapping of these regions by the Direction of Mines and Geology is providing useful basic data.

Therefore in French Equatorial Africa deposits are in all stages of development; regular operations or an improvement of these, systematic prospecting, general reconnaissance, and the like. In the four-year period of 1953-57, taking into consideration the programmes of the enterprises, one could expect a very rapid increase in diamond production. The anticipated production is estimated as follows: 230,000 carats in 1953-54; 300,000 in 1954-55; 350,000 in 1955-56; and 400,000 in 1956-57.

OBSTACLES TO DEVELOPMENT

The first obstacle to be overcome is the problem of investment. The development of recent years has been due to the contribution of outside capital and the self-financing that permitted the purchase of considerable equipment in 1946 is no longer enough. It is above all the relatively recent loans of the Economic Co-operation Administration which have permitted the maintenance of the present work. These loans have been granted to two of the largest companies, the C.M.O.O. and the S.M.I., and their subsidiaries, and amounted to approximately 900,000,000 French francs.

For the future, however, this problem of the contribution of outside capital seems to be more difficult. The anticipated developments will require an investment of 2,850,000,000 French francs, of which self-financing will only be able to supply a small part.

On the other hand, the labour problem is harder to solve. In spite of all efforts towards mechanization, the development of prospecting and production remains tied in with a need to increase the number of workers, who are difficult to recruit and to stabilize because the country already is drained of its population. Moreover, for a long time, the attraction of large centres and the inevitable higher bids of rival industries in growing numbers has been felt acutely; and the administration's role of arbitrator and regulator is often difficult to perform. In the future it is necessary to consider large labour migration into the interior of the country and recruitment in overpopulated urban centres.

In so far as the other difficulties to which the development of diamond production in French Equatorial Africa is subject, the question of organization is paramount. In general this is more easy to solve, as it is a question of investment, problems of power, the provision of workshops, roads, and of transport, and the like. Yet the present situation of the diamond industry of French Equatorial Africa and its prospects for development are favourable. A role of penetration will be carried out, a dominant factor in eastern Ubangi and in Gabon particularly, opening up to modern life and to civilization the regions that have been previously impenetrable.

Development and Operation of the Tsumeb Mine, South West Africa

The development and operation of the Tsumeb Mine, South-West Africa, were described to members of the Mining and Metallurgical Society of America by Mr. M. D. Banghart, managing director of the company, at the Society's dinner meeting held in New York during May of last year. The following article is the condensation of this address, which was published in *Mining and Metallurgical Society of America Bulletin No. 298*, during December, 1953. The article gives a brief history of the property, and in turn describes geological formations, mining methods and ore treatment practice.

The Tsumeb Mine is located near the northern boundary of the mandated territory of South-West Africa at latitude 19° 12′ south and longitude 17° 42′ east, or some 235 miles due north of Windhoek, the capital of South-West Africa. The elevation is 4,200 ft. and the climate excellent. Malaria, which was prevalent when the property was acquired by Tsumeb Corporation, has been completely eliminated by modern malaria-control methods.

In early days copper ore from the outcrop was mined and smelted by natives. The ore deposit was first brought to the attention of Europeans in 1851, but active exploration was not started until 1900 when Otavi Minen und Eisenbahn Gesselschaft was organized by German and British capital. Some 2,100,000 tons of ore had been mined by O.M.E.G. from 1907 to 1940, and profits from 1922 to 1939 were £1,176,965.

In 1946, the Custodian of Enemy Property put the property up for sale and a successful bid of £1,010,000 was made by a syndicate consisting of American Metal Company, Newmont Mining Corporation and British and South African interests. These interests formed Tsumeb Corporation Ltd. which took over the mine in January, 1947. Some 500,000 tons of ore averaging 29 per cent total copper, lead and zinc content were immediately available in surface dumps. No attempt was made to utilize the ore dressing and metallurgical facilities on the property but instead a hand-sorting and jig operation was set up to upgrade the dump ore to a marketable product and by the end of June, 1947, some 12,000 tons had been shipped to overseas smelters. It is interesting to note that aside from the purchase price of £1,010,000, the shareholders were called upon for only an additional £540,000 working capital as the surface dumps were converted into cash so rapidly.

THE MODERN PLANT

In the meantime construction of a 900 tons per day selective-flotation plant was begun and unwatering the mine was started. The flotation plant was placed in operation in March, 1948, and the mine was unwatered to the bottom level by August, 1948. The flotation plant was subsequently enlarged to 1,600 tons per day and is being currently increased to 2,000 tons per day, which is considered to be the ultimate capacity of the property.

Most of the power plant on the property, when taken over by Tsumeb Corporation, was considered to be obsolete with the result that a new diesel plant with a capacity of 6,000 h.p. was purchased and installed by the middle of 1948. Since then a 7,000 h.p. steam plant has been added which permits part of the diesel plant to be utilized for standby purposes. In addition to the construction of a modern mine, mill and surface plant, the complete and modern facilities and amenities have been provided in the town site. The S.W. Africa Government passed legislation whereby Tsumeb was allowed to write off its capital expenditure prior to June 30, 1949, over the following six-year period and all subsequent expenditure in the year incurred.

The Tsumeb ore body is a hydrothermal replacement deposit in folded Pre-Cambrian dolomite. In plan, the deposit is lens-shaped with a maximum width of 250 ft. and a maximum length of 600 ft. In section, the ore body dips 55 deg. south from surface to a depth of 2,000 ft., beyond which it bends back with a dip of 75 deg. north. The ore is associated with an irregular intrusion of aplite cutting across the dolomite beds. Mineralization is localized in the aplite and in the adjoining brecciated dolomite. In the upper levels, the ore is largely confined to a single lens but below the 1,890 level, massive sulphide ore forms a north lens and a south lens that partially enclose a pipe-like body of medium to low-grade disseminated ore, part of which is too low-grade to be mineable under present conditions.

Deep drilling below the 2,390 or bottom level has disclosed that from 3,000 to 3,300 ft. depth a high percentage of the mineralization is in oxides of copper and lead. This deep major oxide mineralization appears to be due to circulating waters in a major fault that cuts the ore body and thus may be local.

WORKINGS AND ORE RESERVES

The existing main operating shaft which goes from surface to the 1,890 level is only 16 by 7 ft. in section and is much too small for deep-level hoisting of 50,000 tons per month which is the planned ultimate capacity of the mine. Accordingly a new vertical 6-compartment shaft, 29 by 9 ft. in section, was started from surface in 1950. This shaft, known as the De Wet shaft, was last reported to have reached a depth of 3,250 ft. and will be continued to its final depth of 4,150 ft. but in the meantime was to be placed in use in July of last year to service the mine above the new bottom level to be opened at 3,150 ft. Two 6-ton skips and a large man cage are to be operated in this shaft. The ore hoist is 1,600 h.p. double-drum Ward-Leonard controlled, and the man-cage hoist is 600 h.p. double-drum, A.C.-controlled handling the cage and counter balance.

In sinking the shaft, strong water flows with pressures as high as 1,000 p.s.i. were encountered. The water flows were controlled and sealed off by cementation injections ahead of sinking. In going through a major fault, some 18,000 bags of cement were injected in one cover of 50 ft. of which 16,000 bags went into one drill hole, the cementation work being done by the Cementation Company of South Africa.

The positive and probable ore reserves to the 2,650-level horizon at June 30, 1952, were :

Short Tons	*Cu*	*Pb*	*Zn*
6,810,000	2.85%	13.25%	5.47%

Drilling below the bottom level (2,390) has indicated that the ore body extends to, at least, a depth of 3,370 ft. so it is reasonable to expect that the life of the Tsumeb ore body will continue for a considerable number of years beyond the period indicated by the presently calculated positive and probable ore reserves.

The bottom level at the time the mine was acquired in 1947 was the 1,890 level (1,890 ft. below surface). Since then an internal winze has been sunk from the 1,890 level and the 2,390 level opened therefrom. This level is now connected to the De Wet shaft. The next level to be opened will be the 3,150 level as it has been decided to establish main haulage levels 750 ft. apart with 250 ft. stopping intervals and service levels at 125 ft. intervals.

Mining is accomplished by horizontal cut-and-fill methods with 60 to 70 per cent of the ore body in stopes and 30 to 40 per cent in pillars. The stopes are laid out in panels across the width of the ore body and are 60 ft. wide and 150 to 250 ft. long depending on the width of the ore body. Some of the pillars are mineable by cut-and-fill methods but most of them get " heavy " and have to be mined by square setting or some modification thereof. Sill or crown pillars are mined at the tail end of pillar recovery operations and are taken out by square setting and a modified top slice method. Waste for fill is brought into the stopes from a waste pass system from a surface glory hole.

The ore passes in the stopes are concrete lined and preferable to any form of timber lining under local conditions. They are equipped with air-operated undercut loading chutes.

The temperature gradient at Tsumeb is approximately 0.75 deg. F. per 100 ft. of depth. At the present time 225,000 c.f.m. of air is exhausted from the mine but equipment is on order to increase this to 450,000 c.f.m. Approximately 2,300 gallons of water per min. are being pumped from the mine of which some 1,100 gallons per min. are coming from the De Wet shaft area. It is expected that cementation work under way will decrease the water flows in the De Wet shaft areas to negligible amounts.

The ore from the mine and surface dumps is crushed through primary jaw crushers and thence to two-stage intermediate crushing with 4½ ft. Symons crushers in open circuit. The final crusher product, which is almost all minus ½ in. goes to the fine-ore bins and thence to three-stage grinding. The final grind is approximately 85 per cent minus 325 mesh.

The initial installation provided for three separate units each with a designed capacity of 300 tons for a total daily tonnage of 900 tons. However by some minor flow sheet changes and some additional equipment, the tonnage was increased to 1,600 tons per day. Due to slow deliveries of equipment at that time, it was necessary to make use of any grinding units that could be obtained quickly. Accordingly two 5 by 7 rod mills, two 5 by 10 rod mills, six 5 by 7 ball mills and one 5 by 10 ball mill were obtained from Johannesburg manufacturers to meet the desired schedule. Two of the 5 by 7 mills are now being replaced by two 9 by 7 mills to increase capacity to 2,000 tons per day.

THE TSUMEB FLOTATION PLANT

The Tsumeb flotation plant is one of the most complicated as well as one of the most interesting selective-flotation operations in the world. There are five flotation circuits in operation as follows :

(1) Low oxide or sulphide ore—copper-lead circuit with single stage cleaning.
(2) Low oxide or sulphide ore—zinc circuit with two-stage cleaning.
(3) High oxide ore—bulk float with single-stage cleaning.
(4) Bulk concentrate separation circuit with two-stage cleaning.
(5) Oxide circuit with two-stage cleaning.

Approximately 35 lb. per ton milled of twelve different reagents are used in the above circuits.

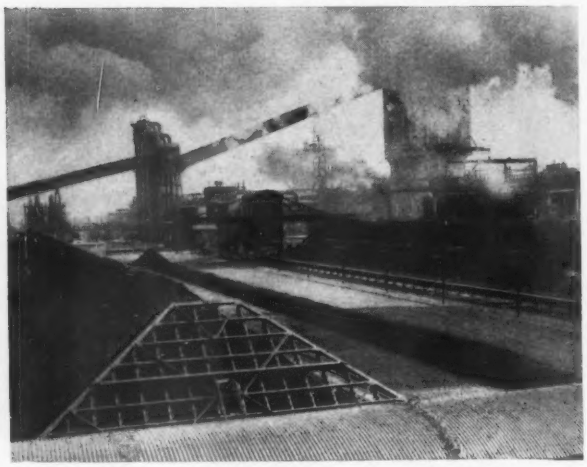
Overall mill recovery is currently running 87 per cent of the copper and 95 per cent of the lead in the copper-lead concentrate and 58 per cent of the zinc in the zinc concentrates. Recovery of copper, lead and zinc in the sulphide or low-oxide circuit is 94, 96, and 66 per cent respectively.

MACHINERY AND EQUIPMENT

G.E.C. Mining Activities in 1953

G.E.C. activities were accelerated during 1953. In connection with the development programme of the N.C.B., two 2,100 h.p. geared A.C. winders were ordered for the new sinkings at Lea Hall Colliery in the Cannock Chase area. Both equipments were to be arranged for dynamic braking. A 1,400 h.p. geared A.C. winder is on order from Garw Colliery, while for Chislet Colliery, Kent, two 1,200 h.p. A.C. winders are in hand. In both cases the equipment will replace steam winders.

The range of liquid controllers of the weir type has been extended to cover motors up to 3,000 h.p. and a unit is now available which is capable of continuous dissipation of 1,500 h.p. when supplied with cooling water at a rate of four gallons per horsepower per hour. The first controller of this rating will be installed for the 3,000 h.p. winder at Cwm Colliery. It is notable that the Koepe winder installed at Bradford



The Robins Messiter coal blending plant at John Summers and Sons Ltd.

Colliery will probably be the first large winder of this type to be commissioned in Britain. These winders are ideal for large coal outputs from the deep levels now being considered. Winding 10 or 12 tons from, say, 3,000 ft. requires a large rope and a drum winder would require a drum of large diameter and consequent high moment of inertia. Furthermore, a Koepe winder can be designed for the deepest level and yet coal can be wound, initially, from shallow levels with a smaller rope.

One of the largest slant haulages in the South Wales coalfields to be equipped with dynamic braking has recently been commissioned at Pantyffynon Colliery, near Ammanford.

A large limestone crushing and screening plant for Beswick's Lime Works, near Hindlow, Derbyshire, is now in process of completion. The contract comprises all the mechanical parts, including all the machinery, conveyors, buildings and so forth. A wing tripper has been ordered to increase the capacity of the coal blending and handling plant supplied to John Summers and Sons Ltd.

Electrical equipment is now being installed at Penrice Quarry of I.C.I. Alkali (Australia) Pty., Ltd., for controlling limestone ore handling plant which includes conveyors, feeders, screens, crushers, tippers, winches, fans, storm water pumps and so forth. The motors, the largest rated at 225 h.p. which drives the jaw-crusher, are controlled in a fixed sequence as dictated by the flow of the material. Any number of sequences can be selected depending upon requirements such as stock-piling, loading and similar operations. Recently supplied to the Australian Aluminium Production Commission were six of the latest "R" type slurry pumps manufactured at Fraser and Chalmers Engineering Works under agreement with the Morris Machine Works of America.

During the year five Chance washery plants were commissioned, the largest capable of handling 465 tons of coal an hour for Mansfield Colliery, Nottinghamshire. Of the others, three were commissioned in South Africa, namely, Schoongezicht, 335 tons an hour; Cornelia, 145 tons an hour; Vierfontein, 330 tons an hour, and one in India at Jamadoba, 300 tons an hour.

Diamond Drilling Tests in the U.S.

Drilling tests by the United States Bureau of Mines have shown conclusively that setting industrial diamonds in diamond-drill bits so that their hard faces will dig into rock and ore increases drilling efficiency and greatly reduces diamond loss per unit of work accomplished.

The industrial diamonds (boart) are fixed in place by casting molten metal around them in the shape of a bit, which is later attached to the drill rod. They usually are set at random without regard to the hard or soft faces of the individual diamonds.

The Bureau's report describes ten tests made to confirm results of earlier experiments which indicated that more footage could be drilled and that diamonds would last longer when set in hard-vector directions. High percentages of high-grade drill bort were set in both hard- and soft-vector directions in diamond bit crowns which were tested in rock about as hard and resistant to drilling as fine-grained granite. Diamond losses in the soft-vector group of bits were consistently higher than those in hard-vector groups in all ten tests. The tests also showed that diamond losses become greater each time the boart are reset in soft-vector directions.

For diamond-drill use, dodecahedral-shaped boart—those with 12 plane faces—appear to be superior to diamonds occurring in other crystal forms. Clear, white, and light-brown diamonds seem more durable than those tinted with gray, pink, green, yellow, or amber. The tests showed that relatively large inclusions and carbon flecks in bort reduce their resistance to shocks and abrasion of drilling. In addition, there is little apparent difference in drilling performance between sound used stones and new stones when high-grade boart are set in hard-vector directions.

Handling Power Cables

The National Coal Board reports the development of a method of preventing damage to power cables supplying coal cutters or cutter loaders at Silverwood Colliery, Rotherham. Cables can be easily damaged if dragged by a machine and this method keeps them clear of the floor as much as possible. A ¾in. diameter haulage rope is attached to the rear end of the cutter. It is passed round a pulley on the conveyor gearhead, back along the full length of the face, round a second pulley on the tension end of the conveyor and then secured to the front end of the cutter. Later trials showed that a better grip was obtained by replacing the last 70yd. of rope on the front end of the cutter by a light chain.

The two power cables, the pilot cable and the high-pressure water cable are all suspended along half the length of the face on steel hooks which slide on to the roof bars. The cables are secured to the chain by a clamp, close to the machine and allowing for a slight loop between the clamp and the machine pommels. The free sections of cables are then lashed to the chain with hemp rope, and as the machine proceeds up the face one man lifts the cables off the hooks and lashes them to the chain. This process is reversed as the machine returns down the face. Kinking and dragging are completely avoided by this method and manhandling of cables is eliminated.

A High Reach Discharge Loader

Under identical title in our issue of February 5, 1954, it was stated that the discharge height of 12 ft. 6 in. achieved by the High Discharge Merton Overloader is higher than that of any tractor mounted loader. The manufacturers now announce that this is not the highest discharge height achieved by any tractor mounted loader, although at the time the announcement was made in good faith.

METALS, MINERALS AND ALLOYS

COPPER.—The U.S. Copper Institute statistics for January (summarized in the table below) show a reduction in U.S. activity resulting in substantially larger stocks of refined. January deliveries were down by 35,100 tons at 77,091 tons, the lowest level since July, 1949. This is attributed to deliberate over buying in December, based on income tax considerations. Stocks outside of the U.S. are no larger than last month, but even so are over double what they were a year ago.

	Production			*Stocks*		
	Jan. 1954	*Jan.-Dec.* 1953	*Jan.-Dec.* 1952	*Jan.* 1954	*Dec.* 1953	*Jan.* 1953
U.S.A.	111,553	1,395,003	1,189,112	108,121	89,193	59,836
Other countries*	85,436	1,122,766	1,196,422	280,510	280,530	120,629
World	196,989	2,517,769	2,385,534	388,631	369,723	180,465

* Excluding U.S.S.R., Japan, Australia, Norway, Sweden and Yugoslavia.

One of the uncertainties so far as the U.S. is concerned is whether the suspension om import duty will be continued The chairman of the House Ways and Means Committee, Mr. Reed, has introduced a Bill to continue suspension until June 30, 1956, but there is some talk of raising the price level of which a 2 c. duty becomes leviable from the 24 c. level at which it now stands. The three big U.S. producers, Anaconda, Phelps Dodge and Kennecott are reported to have reduced output to conform to current consumption and to stabilize the market.

However, the major uncertainy liable to affect copper prices —apart from any protracted and serious decline in U.S. industry—is the manner in which Chilean stocks will eventually be liquidated. These stocks are now reported to total about 147,000 tons. Presumably, Chilean Government finances will compel a decision within the next month or two. Meanwhile it is reported by *Reuter's* Santiago correspondent that the new copper legislation to be submitted to the Chilean Congress includes 12 articles. The main taxation proposal provides for a 75 per cent tax on profits by companies. The rate would decrease if production surpasses 360,000 tons but would not fall below 50 or 60 per cent. The companies would be granted the 110 pesos per dollar rate instead of the present 19.37. The legislation is also reported to provide for the creation of a National Copper Institute to be the controlling body for both sales and production.

The Union Minière reports last year's output of copper as 212,500 tonnes besides 8,232 tonnes of cobalt. Research work on the treatment of cupro-cobaltiferous sulphides, constituting a large part of the group's reserves is stated to have resulted successfully and a pilot plant is under construction. The company has advanced its internal price to Frs. 32.75 per kilo, equivalent to 29.72 c. per lb.

LEAD AND ZINC.—U.S. consumers seem to expect to see the lead price go lower. It is reported that European lead is being offered at 12 c. per lb. N.Y. duty paid, compared with 13 c. for domestic lead. Currently the U.S. price is about 2¼ c. above the New York price, so the trade there regards future L.M.E. price movements as likely to be decisive.

Four bi-partisan senators from Western States had a meeting with President Eisenhower recently following which he requested a White House economist, Dr. Gabriel Hauge, to make a thorough check on all aspects of the lead and zinc industries. The Tariff Commission is expected to hand in its report some time before the dead line in June.

The Bureau of Mines reports U.S. domestic production last year at 335,412 s.tons against 390,161 in the previous year.

Despite the heavy cuts in zinc production in the U.S. now reported as totalling around 13,000 s.tons a month, producers were reported last week to be still accumulating stocks. On Monday, the A.S. and R. cut their price for prime Western to 9.25 c. per lb. East St. Louis with other sellers expected to follow.

The Bureau of Mines reports domestic mine production last year at 534,730 s.tons against 666,000 s.tons in 1952.

TIN.—Undeterred by considerations that the U.S. now seems unlikely to co-operate actively in the proposed international Tin agreement the price on the L.M.E. has continued to advance this week. The U.S. decision on the draft agreement seems to be expected early next month, after the report of the conference with consumers due to open on Thursday next has been considered.

The question of the closing of the Texas smelter is now under active examination. The Bolivian Ambassador in the U.S. has stated that the delivery of the 10,000 tons of tin sold to the U.S. has now been completed and they are awaiting the decision regarding the smelter before entering on any further negotiatins. Incidentally, it has been reported that the Banco Minero has been buying tin from the miners at 90 c. and selling it at 82 c.

There seems to be a movement to reduce taxation of tin mining interests in several countries. In Malaya, the F.M.S. Chamber of Mines, the All-Malayan Chinese Mining Association, directors of mining companies and mining representatives in the Legisaltive Council, have all repeatedly asked—so far without result—for a revision of the export duty, estimated to range from 15 to 18 per cent. Now the industry has complained about its severity to the Word Bank Mission currently visiting Malaya. The Government of the Congo, as a result of the fall in prices last year, reduced export duties to Frs. 820 and Frs. 589 for metal and concentrates respectively from January 1 last.

ALUMINIUM.—French output achieved a record last year at 112,500 tonnes, an increase of some 6,000 tonnes. The chief stimulant was overseas demand which absorbed 44,000 tonnes (against 16,500 tonnes), the U.S. and U.K. being the chief outlets. French metal is now only slightly above the Canadian price, and has the additional attraction of being a dollar saver.

Leading French producers are examining the possibility of establishing refineries in other countries where electric power is cheaper. Approval in principle is reported to being given to the establishment of a plant in the French Cameroons, power to be derived from Edea, near Douala, beginning with a 20,000 kW. unit to be enlarged up to 105,000 kW. Alumina would be imported from France up to an eventual total of 40,000 tons of metal. Another scheme still being discussed is to establish a refinery in French Guinea where deposits in the Loos Islands and adjacent territory are rich in bauxite.

U.K. PRIMARY METAL STATISTICS—DECEMBER and Full Year

(long tons)

	Refined Copper			*Lead†*			*Slab Zinc*			*Tin metal*		
	Dec. 1953	*Jan.-Dec.* 1953	*Jan.-Dec.* 1952	*Dec.* 1953	*Jan.-Dec.* 1953	*Jan.-Dec.* 1952	*Dec.* 1953	*Jan.-Dec.* 1953	*Jan.-Dec.* 1952	*Dec.* 1953	*Jan.-Dec.* 1953	*Jan.-Dec.* 1952
U.K. stocks beginning period	36,748¶	91,548§	87,251§	29,174¶	23,090¶	77,167§	22,462¶	166,050§	39,659§	3,031§	4,225§	8,004§
Imports	18,843	228,024	212,145	17,667	190,232	146,811	14,977	130,949	229,181	25	1,048	2,885
Production	17,430	104,212	151,701	5,477	73,424	86,070	6,806	72,711	68,733	2,249*	28,860*	29,521*
Consumption	32,570*a*	321,054*a*	347,646	18,929	220,848	194,650	20,428	192,407	170,885	1,768	18,634	22,554
Exports and Re-exports	4,835	17,397	684	2,408	24,902	42,863	523	11,622	144	823	14,435	21,928
U.K. stocks end period‡	37,246¶	37,246¶	91,548§	26,887¶	26,887¶	75,510§	27,652¶	27,652¶	166,050§	3,085§	3,085§	4,225§

(Source : British Bureau of Non-Ferrous Metal Statistics)

*Estimated by International Tin Study Group. †Includes imported virgin lead and English refined from domestic ore and secondary metal. §Including any Government stocks other than strategic reserves. ¶Excluding Government held stocks. ‡In addition U.K. stocks of blister copper at the end of December were 18,098 tons ; of zinc concentrates were 45,731 tons, and of tin ore were 2,450 tons. *a*Includes copper refined from secondary metal.

Further discoveries of bauxite are reported from the Good Hope area in Jamaica, reputed to be equal to anything yet discovered in the Island.

Japanese output last year improved by 2,932 tonnes to a post-war high of 45,493 tonnes. Deliveries, however, were in excess of this figure at 51,470 tonnes.

NICKEL.—As part of the U.S. Administration's nickel expansion programme (see this column December 12) plans are being made to enlarge production of nickel from the Nicaro deposits in Cuba by some 75 per cent, raising last year's output of some 14,000 s.tons to around 25,750. Two undertakings are at work in the Cuban nickel producing area, the government's own Nickel Processing Corporation, operated by the National Lead Company and the Nicaro Nickel Company which is a subsidiary of the Freeport Sulphur Company. This company has just been granted a certificate of necessity for $55,250,000 for developing facilities at Moa Bay in the island.

Studies of the stockpile deliveries and military requirements are now being made to determine how much metal will be available for civilian use after these major requirements are met. The review of the present stockpile goal will be expected by the end of next month. The immediate supply position for U.S. civilian users remains tight with some consumers experiencing delivery cuts for the first quarter of 1954 of as much as 25 -30 per cent. Mr. Fleming, the Defense Mobiliser, stated at the beginning of this week that, over 1954 as a whole, U.S. civilian users would receive about the same quantities as last year.

Projected increases in nickel output are not confined to the United States. Canada last year produced about 85 per cent of the free world output or 152,500 s.tons compared with a total free world output for this year estimated at 190,000 s.tons. Six years hence this figure, according to some estimates, may reach 300,000 s.tons.

TUNGSTEN.—The price of concentrates delivered U.S. ports was reduced this week to $16/18 per l.ton unit, from the previous quotation of $19/20.

The South Korean Government has requested an extension of its agreement with the U.S. to supply the latter with tungsten concentrates. The current agreement is due to expire at the end of March. The U.S. authorities in Korea are, however, quoted as having told the Government that the U.S. had no intention of renewing or extending a tungsten agreement with any country. They have apparently intimated that Korea had better develop a new free market.

Under the current agreement concluded on March 31, 1953, the U.S. gives the necessary technical and financial assistance to Korea for tungsten mining, while South Korea undertakes to sell its whole output of tungsten concentrates to the U.S. The agreement foresaw that South Korea would deliver 15,000 s.tons of concentrate to the U.S. However, its output for 1953 was only 7,416 s.tons.

In the U.K. there have been more enquiries during the past week and buyers who have laid off for many months appear now to be of the opinion that prices will not go much lower, and are coming into the market for small parcels. This opinion appears to be strengthened by the fact that the Ministry of Materials has not made any further reduction in their price.

The London Metal Market

(From Our Metal Exchange Correspondent)

There is very little to report on the tin market which has been advancing steadily. Stocks of metal in official warehouses have fallen, and as a consequence of this and of a tight technical position the backwardation has increased to around £25 per ton. The increase in price of over £670 per ton seems likely to encourage holders to release metal for early prompt dates. On Thursday morning the Eastern price was equivalent to £656¼ per ton c.i.f. Europe.

Copper is scarce for early delivery, and the Government Broker has been called upon to make almost daily sales and has been paid up to £240 per ton. Demand for home consumption has been well maintained, and the Continent continues to pay good prices for metal, especially for early delivery. There is no news regarding negotiations for the sale of the Chilean surplus to the American stockpile, and meanwhile current production must be adding considerably to the accumulation.

A fair consumer business is being done in lead in this country, and prices have shown very little change. In America the offtake is reported as being only fair.

Some selling of zinc occurred here, probably for American account, but this was absorbed quite well without unduly depressing prices, and when the American quotation was reduced to 9½ c. per lb. on Monday the London market was not influenced.

Closing prices and turnovers are given in the following table:—

	February 11		February 18	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Tin				
Cash	£655	£656	£670	£672½
Three months	£635	£636	£643	£645
Settlement	£656		£672½	
Week's turnover	310 tons		515 tons	
Lead				
Current month	£82½	£82¾	£82	£82¼
Three months	£81¼	£82	£81¼	£81½
Week's turnover	3,950 tons		3,125 tons	
Zinc				
Current month	£72	£72¼	£71½	£71¾
Three months	£70½	£70¾	£70¾	£70½
Week's turnover	7,075 tons		2,775 tons	
Copper				
Cash	£228½	£229	£235	£236
Three months	£214	£214½	£217½	£218
Settlement	£229		£236	
Week's turnover	4,200 tons		4,500 tons	

OTHER LONDON PRICES — FEBRUARY 18

ANTIMONY

English (99%) delivered, 10 cwt. and over .. .. £210 per ton
Crude (70%) .. .. .. £200 per ton
Ore (60% basis) .. .. .. 22s./24s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) .. .. £483 per ton

OTHER METALS

Aluminium, 99·5% £156 per ton
Bismuth (min. 4 cwt. lots) 16s. lb.
Cadmium (Empire), 13s. lb.
Chromium, 6s. 5d./7s. 6d. lb.
Cobalt, 20s. lb.
Gold, 248s. f.oz.
Iridium, £60 oz. nom.
Magnesium, 2s. 10½d. lb.
Manganese Metal (96%-98%) £225/£262
Osmiridium, £40 oz. nom.
Osmium, £65/£70 oz. nom.
Palladium, £7 15s./£8 10s. oz.
Platinum, £30/£33
Rhodium, £42 10s. oz.
Ruthenium, £25 oz.
Quicksilver, £63 10s./£64 10s. ex-warehouse
Selenium, 30s. 6d. nom. per lb.
Silver 73¾d. f.oz. spot and f'd.
Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC.

Bismuth .. .. 40% 6s. 3d. lb. c.i.f.
30% 5s. 0d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £14 5s. 6d. per ton c.i.f.
„ „ (concentrates) £14 5s. 6d. per ton c.i.f.
„ „ Refractory £13 17s. 6d. per ton c.i.f.
Baluchistan Metallurgical .. £15 19s. 6d. per ton c.i.f.
Magnesite, ground calcined .. £26 - £27 d/d
Magnesite, Raw .. .. .. £10 - £11 d/d
Molybdenite (85% basis) .. 102s. 4d.-103s. per unit c.i.f.
Wolfram (65%) .. .. .. World buying 102s. 6d. nom.
„ „ .. .. .. 145s. nom. U.K. Selling
Scheelite (65%) .. .. .. World buying price nom.
„ .. .. .. 140s. nom. U.K. Selling
Tungsten Metal Powder (98% Min. W.) .. .. 13s. 8d. nom. per lb. (home)
Ferro-tungsten .. .. .. 10s. 8d. nom. per lb. (home)
Carbide, 4-cwt. lots .. .. £35 13s. 9d. d/d per ton
Ferro-manganese, home .. .. £53 10s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46% - 48%) .. .. .. 7s. 11d. - 8s. 4d. per unit
Brass Wire .. .. 2s. 4½d. per lb. basis
Brass Tubes, solid drawn .. 1s. 8¾d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

The past week has seen some falling off in the volume of business and markets have paused for breath. Naturally, some considerable profit-taking occurred after the recent sharp advance, but towards the end of the period the firm undertone reasserted itself although business conditions remained much quieter. Gilt-edged were only slightly affected by the new £80,000,000 Transport Loan carrying a 4 per cent coupon and floated at 101 per cent. The cumulative revenue position has turned out better than last year despite large supplementary estimates.

Kaffirs were active. The lower price levels ruling at the beginning of the week quickly brought in buyers both in London and Johannesburg and net gains were recorded over the period by most of the popular counters. A focal point of interest was the Hartebeest flotation. Rights will be offered to shareholders in New Pioneer, Middle Witwatersrand, East Rand Extensions, Alpha, Free State and Southern Van Ryn in varying proportions at 16s. a share. These shares will in turn carry a two for three option at 16s. exercisable during March, 1955. An opening premium is expected and the options may well become valuable as time goes on.

In sympathy West Rand issues attracted more interest and good gains were recorded. Some of the older properties on other parts of the Rand also improved following the better African labour figures. These encouraged hopes of lower working costs, an important factor in old mines not scheduled as potential uranium producers. Dominion Reefs encountered some profit-taking and fell from last week's high level.

The O.F.S. section still retained much of the market interest. Some of the recent gains in such issues as Harmony and St. Helena were not held, but President Brand again shot ahead pursued scarcely less vigorously by President Steyn. Merriespruit were also popular.

The West African and Western Australian markets were neglected and the rather better news from the Dalny property owned by Falcons passed unnoticed. Bushtick Mines will not now go into liquidation; the new board propose to investigate certain gold and uranium propositions. Shareholders who do not care to continue their interest are offered 3s. 3d. per share.

Diamonds improved headed by De Beers. The cheap lines of O.F.S. shares acquired by this company some time ago are beginning to carry more and more significance as the rise in Kaffir prices goes on.

In the copper market Tanks and Chartered were again well supported and Messina rose after publication of the annual figures and the satisfactory ore reserve position. Work on the Mufulira property was brought to a temporary standstill by the flooding of the power plant after an exceptionally heavy rainstorm. Rhodesia Katanga slipped following the disappointing six monthly report. Water and drilling difficulties have been encountered. There was no confirmation of recent optimistic borehole rumours. The surprise new issue recently announced by Esperanza has kept the shares down in a quiet market.

Eastern Tins were idle and recorded only minor adjustments. There has been some agitation in Malaya towards a reduction of the export duty on tin. Beralts rose sharply on hopes of an improvement in the price of wolfram; the company's very strong cash position came in for favourable notice. Amalgamated Tin of Nigeria were helped by the increase in the second interim dividend. The company has so far paid 20 per cent as against 16 per cent for the comparable period for 1952/53. Jantar hardened on the completion of a U.S. contract to sell all its available columbite production up to June 30 at approximately £2,100 per ton.

In the miscellaneous base metal section Amalgamated Collieries of South Africa again rose and Associated Manganese encountered strong buying. Consolidated Murchison also recorded a further advance following the news that the company had made a profit of £70,433 during the December quarter. This compares with a loss of £46,792 for the September quarter.

FINANCE	Price Feb. 17	+ or — on week
African & European	2 9/16	.....
Anglo American Corpn.	6 3/8	.....
Anglo-French	20/9	.....
Anglo Transvaal Consol.	23/9	+1/3
Central Mining (£1 shrs.)	29/9	+3d
Consolidated Goldfields	49/-	+6d
Consol. Mines Selection	31/10½	—7½d
East Rand Consols	3/9	+1½d
General Mining	4	+ 1/16
H.E. Prop	38/9	.....
Henderson's Transvaal	8/3	.....
Johnnies	50/3	+10½d
Rand Mines	3 1/16	.....
Rand Selection	35/-	.....
Strathmore Consol.	36/3	.....
Union Corp. (2/6 units)	31/9	+9d
Vereeniging Estates	4 1/8	.....
Writs	35/-	—7½d
West Wits	40/-	+1/3
RAND GOLD		
Blyvoors	34/-	—3d
Brakpan	9/4½	+10½d
City Deep	20/-	+7½d
Consol. Main Reef	17/6	+1/3
Crown	40/-	+2/6
Daggas	3 11/32	— 1/32
Doornfontein	26/6	+1/3
Durban Deep	35/7½	+1/10½
E. Daggas	13/3	+1/-
E. Geduld .. (4/- units)	26/-	.....
E. Rand Props	2 11/32	+ 1/8
Geduld	3 5/16	.....
Govt. Areas	11/6	+1/-
Grootvlei	20/3	+6d
Libanon	10/3	+1/4½
Luipaards Vlei	25/-	+3d
Marievale	17/9	.....
Modderfontein East	13/9	.....
New Kleinfontein	15/7½	.....
New Pioneer	21/6	—6d
Randfontein	69/9	—3d
Robinson Deep	12/3	+2/-
Rose Deep	14/-	.....
Simmer & Jack	4/3	.....
S.A. Lands	21/10½	+1/10½
Springs	5/6	—1½d
Stilfontein	28/1½	+10½d
Sub Nigel	36/3	+2/6
Van Dyk	5/4½	+7½d
Venterspost	13/9	+1/3
Vlakfontein	15/6	+2/-
Vogelstruisbult	37/-	+2/9
West Driefontein	5 1/8	+ 1/16
W. Rand Consolidated	2 13/32	+ 1/32
Western Reefs	2 13/32	+ 1/32

O.F.S.	Price Feb. 17	+ or — on week
Freddies	10/3	+3d
Freddies N.	11/9	+4½d
Freddies S.	9/10½	+4½d
F. S. Geduld	4 13/32	+ 1/32
Geoffries	16/6	—3d
Harmony	31/9	—9d
Loraine	13/6	—3d
Lydenburg Estates	18/-	+2/3
Merriespruit	12/1½	+2/-
Middle Wits	17/3	—3d
Ofsits	2 13/32	+ 1/32
President Brand	51/9	+5/3
President Steyn	34/9	+3/9
St. Helena	19/9	—9d
Virginia Ord.	14/3	.....
Welkom	18/9	+6d
Western Holdings	4 11/32	— 1/32
WEST AFRICAN GOLD		
Amalgamated Banket	1/7½	.....
Ariston	5/4½XD	—1½d
Ashanti	19/6	—1½d
Bibiani	4/4½	.....
Bremang	2/1½	.....
G.C. Main Reef	3/4½	—1½d
G.C. Selection Trust	6/3	—1½d
Konongo	2/3	.....
Lyndhurst Deep	1/-	.....
Marlu	1/6	.....
Taquah & Abosso	2/4½	—1½d
AUSTRALIAN GOLD		
Boulder Perseverance	3/-	.....
Gold Mines of Kalgoorlie	13/6	.....
Great Boulder Prop.	8/6	.....
Lake View and Star	13/3	.....
Mount Morgan	19/6	.....
North Kalgurli	6/9	+3d
Sons of Gwalia	5/6	.....
South Kalgurli	6/9	.....
Western Mining	11/9	.....
MISCELLANEOUS GOLD		
Cam and Motor	9/3	.....
Champion Reef	4/7½	—3d
Falcon Mines	7/9	.....
Globe & Phoenix	23/-	.....
G.F. Rhodesian	5/10½	—6½
London & Rhodesian	4/7½	.....
Motapa	2/6	.....
Mysore	4/7½	—3d
Nundydroog	5/7½	—3d
Ooregum	3/4½	—1½d
Oroville	16/6	.....

MISCELLANEOUS GOLD (contd.)	Price Feb. 17	+ or — on week
St. John d'El Rey	19/4½	—1½d
Zams	32/-	+9d
DIAMONDS & PLATINUM		
Anglo American Inv.	4 9/16XD	+ 1/16
Casts	23/3	+2/3
Cons. Diam. of S.W.A.	4 1/8	.....
De Beers Defd. Bearer	79/3	+1/3
De Beers Pfd. Bearer	15 1/8	— 1/8
Pots Platinum	9/3	+3d
Watervaal	15/-	.....
COPPER		
Chartered	63/7½	+1/10½
Esperanza	6/3	—1½d
Indian Copper	4/6	.....
Messina	3 1/16	+ 1/16
Nchanga	6 1/16	.....
Rhod. Anglo-American	49/9	+6d
Rhod. Katanga	14/4½	—1½d
Rhodesian Selection	14/7½	—1½d
Rhokana	18½	.....
Rio Tinto	20	+1
Roan Antelope	14/7½	—3d
Selection Trust	37/3	—3d
Tanks	61/-	+1/6
Tharsis Sulphur Br.	51/3	+1/3
TIN (Eastern)		
Ayer Hitam	24/6	.....
Gopeng	7/1½	—1½d
Hongkong	6/3	+4½d
Ipoh	15/3	—4½d
Kamunting	8/-XD	.....
Kepong Dredging	4/3	.....
Kinta Tin Mines	10/3	.....
Malayan Dredging	25/-	—7½d
Pahang	11/10½	.....
Pengkalen	7/6	+3d
Petaling	7/9	—1½d
Rambutan	12/3	.....
Siamese Tin	7/9	+6d
Southern Kinta	13/-	—1½d
S. Malayan	22/9	—3d
S. Tronoh	7/6	.....
Sungei Kinta	9/6	—9d
Tekka Taiping	5/6	.....
Tronoh	21/6	.....
TIN (Nigerian and Miscellaneous)		
Amalgamated Tin	12/4½	+9d
Beralt Tin	20/-	+1/10½
Bisichi	4/9	+1½d
British Tin Inv.	13/3	.....
Ex-Lands Nigeria	2/7½	.....

TIN (Nigerian and Miscellaneous) contd.	Price Feb. 17	+ or — on week
Geevor Tin	10/-	+1½d
Gold & Base Metal	3/-	.....
Jantar Nigeria	7/10½	+7½d
Jos Tin-Area	12/9	+3d
Kaduna Prospectors	2/1½XD	.....
Kaduna Syndicate	2/1½XD	.....
London Tin	5/6	+1½d
United Tin	3/1½	.....
SILVER, LEAD, ZINC		
Broken Hill South	2 1/16	— 1/16
Burma Mines	1/10½	.....
Consol. Zinc	27/-	—2/-
Lake George	6/3	+9d
Mount Isa	32/-	.....
New Broken Hill	22/6	.....
North Broken Hill	2 13/32	— 1/32
Rhodesian Broken Hill	9/7½	+6d
San Francisco Mines	16/-	+3d
Uruwira	3/1½	+3d
MISCELLANEOUS BASE METALS & COAL		
Amal. Collieries of S.A.	42/-	+9d
Associated Manganese	48/-	+3/3
Cape Asbestos	24/4½	—3d
C.P. Manganese	55/-	—1/3
Consol. Murchison	36/-	+1/-
Mashaba	3d	.....
Natal Navigation	2 13/32	— 1/32
Rhod. Monteleo	1/6	+3d
Turner & Newall	72/3	—2/9
Wankie	13/7½	+1½d
Witbank Colliery	3 1/16	.....
CANADIAN MINES		
Dome	$29½	.....
Hollinger	$26	—½
Hudson Bay Mining	$75	.....
International Nickel	$69¼	—1
Mining Corpn. of Canada	£4	+¼
Noranda	$116	+3
Quemont	£5 1/8	+1/8
Yukon	3/10½	.....
OIL		
Anglo-Iranian	9½	+ 1/16
Apex	44/4½	+7½d
Attock	37/6	.....
Burmah	63/9	—1/3
Canadian Eagle	29/10½	+4½d
Mexican Eagle	19/7½	—1½d
Shell (bearer)	5 1/16	—¼
Trinidad Leasehold	19/9	—4½d
T.P.D.	25/9	—1/-
Ultramar	28/10½	+10½d

COMPANY NEWS AND VIEWS

Rand and O.F.S. Returns for January

Because the majority of the Rand and O.F.S. gold mining companies complete their financial year in December, we have changed the usual form of our monthly output table, so that the January figures compare with the results for the previous month and for the last complete financial year, instead of giving the cumulative figures to-date which would be the same for those companies whose year ends in December. The usual form in which the table is presented will appear with the monthly figures published for February.

Based on a gold price of 248s. 2d. per oz., against 247s. 3d. in December, the January mine returns for the Rand and O.F.S. gold producers showed a general improvement.

West Rand Consolidated, which is now showing its gold and uranium profits separately each month, announced uranium profits of £160,000 and gold profits of £11,488 giving a total working profit of £171,488 against £142,989 in December.

A noteworthy feature of the January returns was the entry into the list of gold producers of Ellaton Gold Mining, which is in the Strathmore group. The company announced a tonnage throughput of 21,000 tons and a profit of £457. But it was also stated that an additional revenue of £28,207 had accrued during January in respect of trial runs of the plant.

Company	*January, 1954* Tons (000)	Yield (oz.)	Profit (£000)	Yr. ends	*December, 1953* Tons (000)	Yield (oz.)	Profit (£000)	*Last Complete Financial Year* Tons (000)	Yield (oz.)	Profit (£000)
Gold Fields										
Doornfontein	48	14,406	51·9	J	44	13,201	42·3	—	—	—
Libanon	92	18,869	49·0	J	88	18,152	46·5	985	197,552	500·6
Luipaards Vlei	106	19,615	38·9	J	104	19,309	36·3	1232	231,234	568·1
Rietfontein	27	6,009	23·4	D	27	6,187	24·0	321·5	71,878	299·4
Robinson	96	20,016	20·1	D	100	20,500	14·4	1165	229,069	158·4
Simmer & Jack	128	20,483	14·7	D	128	20,474	11·9	1477	138,340	152·9
Sub Nigel	66	21,945	98·5	J	66	22,012	97·3	788	270,871	1352·0
Venterspost	107	25,145	59·6	J	107	25,199	57·3	1219	285,071	726·0
Vlakfontein	38	13,548	73·0	D	38	13,654	72·1	444	160,975	864·6
Vogels	99	25,261	107·1	D	102	25,577	106·0	1180	297,991	1208·1
West Drei	45	34,232	282·2	J	45	34,569	280·6	386	261,743	2032·7
Anglo American*										
Brakpan	114	20,017	23·5	D	114	20,300	22·9	1377	246,290	271·2
Daggas	211	49,417	303·9	D	210	49,319	299·6	2608	613,874	3900·7
East Daggas	94	15,999	47·3	D	95	16,161	48·9	1104	190,906	583·8
S.A. Land	99	18,231	53·4	D	101	18,537	52·8	1204	219,849	619·7
Springs	131	18,468	9·4	D	134	18,595	9·1	1735	238,895	120·8
Welkom	60	11,957	L 5·9	D	65	12,979	4·6	759	148,540	122·9
Western Hldgs.	47	14,513	45·0	D	46	13,767	40·2	243	65,883	121·1
W. Reef Ex.	108	21,658	65·7	D	110	22,010	67·9	1311	267,126	934·6
Central Mining										
Blyvoor	94	55,462	438·2	J	95	55,884	442·6	1219	732,733	6172·7
City Deep	165	31,513	20·2	D	163	31,272	18·1	1922	371,017	254·4
Cons. M.R.	156	22,492	21·8	J	158	22,995	19·3	2107	293,871	269·7
Crown	262	42,252	48·4	D	271	42,983	51·9	3272	518,576	519·2
D. Roodepoort	175	28,517	49·7	D	178	28,981	56·7	2143	357,814	749·1
East Rand Prop.	189	43,376	122·5	D	186	42,683	117·6	2273	506,631	1358·2
Modder B.	56	5,797	3·1	D	53	5,676	2·6	651	69,679	23·4
Modder East	110	12,730	12·1	J	106	12,541	10·0	1382	159,447	238·4
Rose Deep	66	10,232	13·3	D	66	10,265	10·0	865	229,333	105·2
Welgedacht	32	4,004	2·1	J	33	4,095	1·9	401	49,815	51·7
J.C.I.*										
E. Champ d'Or	23	2,285	L 8·9	D	20	2,605	L 9·0	285	43,385	L 18·7
Freddies N.†	27	5,001	L19·4	D	26	5,002	L 23·8	150	26,292	L136·1
Freddies S.†	35	5,005	L18·3	D	31	4,600	L 22·2	172	28,466	L124·9
Govt. G.M.A.	254	32,420	30·0	D	249	32,444	30·1	2952	396,243	580·7
New State	11	2,910	1·7	D	13	2,889	1·3	307	50,509	12·4
Randfontein	280	39,553	25·6	D	294	39,392	25·5	3661	468,216	317·6
Union										
East Geduld	126	38,751	280·5	D	128	39,363	285·9	1610	485,266	3597·7
Geduld Prop.	90	14,718	25·5	D	90	14,531	23·0	1125	179,265	360·9
Grootvlei	175	37,193	207·4	D	180	38,251	209·1	2203	469,198	2723·3
Marievale	62	15,692	67·2	D	62	15,234	65·2	749	183,210	795·0
St. Helena	77	16,591	49·2	D	76	16,200	44·6	799	162,333	317·2
Van Dyk	78	13,636	3·3	D	79	14,152	2·4	1022	169,372	15·3
General Mining*										
S. Roodepoort	27	5,912	20·2	J	27	6,058	20·1	322	73,709	279·3
W. Rand Cons.‡	215	28,290	171·4	D	208	28,239	62·0	2651	366,094	999·8
Anglo Transvaal*										
N. Klerksdorp	98	1,301	L 1·4	D	11	1,442	0·3	129	17,188	7·0
Rand Leases	157	27,241	16·5	J	154	26,830	13·2	2041	346,611	490·9
Village M.R.	34	5,235	12·0	J	34	5,258	12·1	405	63,228	166·0
Others										
N. Kleinfontein	107	13,667	20·1	D	106	13,440	20·0	1289	165,701	296·1
Spaarwater	10	2,569	L 0·9	D	10	2,569	L 2·7	125	28,919	L 36·1
Stilfontein	74	22,970	119·2	D	72	21,964	111·9	780	229,430	1146·5
W. Nigel*	17	3,916	9·1	J	17	3,965	8·9	202	—	89·6

Notes.—Profit figures are in all cases figures of working profit excluding profit from sale of gold at premium prices. In cases of groups marked with an asterisk(*) profit includes sundry revenue. Profit figures preceded by L indicates a loss.
† Excluding development expenditure.
‡ January profit includes £160,000 from uranium and adjustments for the current financial year.

Hartebeestfontein's New Issue

At the end of last week it was announced that an issue of 3,400,000 shares of 10s. each in Hartebeestfontein Gold Mining would be offered at 16s. per share.

Of the total number of shares to be issued, 2,112,149 shares are to be offered to shareholders in the following companies in the ratios here stated: Middle Witwatersrand, 1 for 9; New Pioneer, 11 for 25; Eastern Rand Extension, 1 for 5; Alpha Free State, 1 for 5; and Southern Van Ryn, 3 for 50.

The remaining 1,287,851 shares are to be taken up firm at 16s. per share by Anglo American Corporation of South Africa, Middle Witwatersrand (Western Areas), and Strathmore Consolidated Investment.

These new shares, together with the originally issued 4,000,000 shares of 5s. each, which have now been converted into shares of 10s. each, thereby making a total of 5,400,000 shares of 10s. each, carry options exercisable during the month of March, 1955, to take up further shares at 16s. each in the ratio of 2 more "Hartebeest" shares for every 3 then held.

Next October, Anglo American Corporation of South Africa will loan "Hartebeest" a further £600,000 as an unsecured loan carrying interests at the rate of 6 per cent per annum, which will rank for repayment equally with the unsecured loan of £1,500,000, already lent to "Hartebeest" by the Corporation under arrangements concluded in 1952. Half the profits available for dividend will be allocated for the repayment of these loans and any balance outstanding on September 30, 1965, will be repayed in full on that date.

This amount, together with the issue now pending and the sum of £1,500,000 represented by the options, amounts to £6,200,000 which, with the capital already raised through the loan from Anglo American Corporation, is estimated to be sufficient to bring the mine into production on a basis of 75,000 tons per month, some time in 1956.

Prospectuses and letters of application for the issue will be posted on or about March 15 next.

Consolidated Murchison's Good December Quarterly Profit

The December quarterly report of Consolidated Murchison (Transvaal) Goldfields and Development Company reveals an estimated profit from the production of antimony and gold of £70,433 which compares with a loss of £46,792 in the September quarter and a profit of £134,140 in the June quarter.

The quarterly statement announces that taxation for the 12 months ended December 31, 1953, is estimated at £68,250 in respect of total profits for the year of £283,785.

Capital expenditure during the quarter amounted to £1,193 compared with £2,856 in the September quarter and £24,965 in the June quarter.

During the quarter development footage advanced amounted to 220 ft. The whole of this footage was accomplished in a lens known to carry gold values. 210 ft. were sampled and proved to be unpayable, the average value being 5 dwt. per ton over a width of 79 in., equivalent to 395 in. dwt. Full details of the December quarter's results are given on page 216 of this issue.

Messina's All-round Improvement

One of the features contained in the report and accounts of Messina (Transvaal) Development Company for the year ended September 30 last was the perceptible strengthening or the ore reserves to which the Campbell section was the largest contributor.

Year to Sept. 30	*Total Ore handled Milled (l.tons)*	*Assay (%Cu)*	*Content (tons Cu)*	*Output Ingots (tons)*	*Cost per ton produced* s.	d.	*Ore Reserves (tons) (000)*	*(%Cu)*
1953	761,060	1.8	13,985	13,664	33	10	4,065	2.12
1952	726,690	1.9	13,831	10,604	29	6	3,870	2.15

Monthly ore production averaged 61,970 tons against 60,740 tons in the preceding year and the crushing plant handled an average of 63,422 tons against 60,558 tons per month. The general manager in his report states that there was a considerable increase in the tonnage of old jig tailings retreated. This tonnage expanded from 12,899 tons to 63,375 tons and resulted in an estimated net revenue of £59,800 during the year.

The financial results were also eminently satisfactory although costs per ton produced advanced somewhat sharply

due, the report states, to a general all-round increase in nearly all departments.

Year to Sept. 30	Copper Sales	Mining Costs	Taxation	Net Profit	Dividend	To Reserves
	£	£	£	£	%	£
1953	3,339,773	1,257,715	578,290	1,538,796	400	240,000
1952	3,077,652	1,075,530	564,643	1,397,085	350*	330,000

* Includes interim payment of 150 per cent paid on issued capital of £250,000 and a final dividend of 200 per cent paid on the present issued capital of £325,000 in stock units of 5s. each.

The total capital expenditure incurred during the year amounted to £423,411 of which £96,075 was expended in acquiring the Umkondo property and work preparatory to mining operations.

Commander H. F. P. Grenfell is chairman. Meeting, Johannesburg, March 10.

January Tin Returns

Amalgamated Tin Mines of Nigeria and its two subsidiaries, Keffi Tin and London Nigerian, whose excellent production returns for tin and columbite in the December quarter were the subject of comment in these columns in last week's issue, has now declared a second interim dividend of 12 per cent making, with the first interim of 8 per cent already paid, a total of 20 per cent to-date in respect of the year ending March 31, 1954. This second interim distribution of 12 per cent compares with an 8 per cent dividend declared for the corresponding period a year ago. Thus it appears likely that the total distribution for the year will be at least 35 per cent as the final payment a year ago was 14 per cent which, with the two interims of 8 per cent each, totalled 30 per cent for the year.

Pengkalen announced its fourth interim dividend in respect of the year ended September 30, 1953, bringing the total distribution to-date to 20 per cent which compares with four interim payments a year ago totalling 30 per cent. Output of tin for the year ended September 30 last totalled 321 tons compared with 531 tons in the preceding year. Production for the first three months of the current year amounted to 120 tons compared with 95½ tons in the corresponding period of the year under review.

Kinta Kellas looks interesting. Production for the first 10 months of the current year at 264 tons shows an improvement of no less than 114 tons over the corresponding period a year ago.

Company	Jan.	Months since year end	Financial Year to Date This	Financial Year to Date Last	Company	Jan.	Months since year end	Financial Year to Date This	Financial Year to Date Last
EASTERN					**NIGERIA**				
Ampat	99½	1	99½	90½	Ex-Lands	70	1	70	68
Bangrin	66½	1	66½	85	Filani	2½	1	2½	4½
Batu S.	21½	4	101½	82½	Gold & Base	43	1	43	35
Berjuntai	66½	9	479½	751½	Gold & Base*	10½	1	10½	3½
Kamunting	138½	10	1154½	1683	Jantar	16	3	48	60
Kinta K.	23½	10	263½	150	Jantar*	18	3	54	56
Kinta T.	26½	1	26½	20½	Jos Tin	13½	6	77½	85½
Klang River‡	29½	10	405½	285½	Kaduna P.	8½	1	8½	8½
Kuala K.	171	10	1613½	1801	Kaduna S.	32	1	32	21
Kuchai	29½	4	122	240½	Keffi Tin	9	10	47½	234
Larut§	78½	1	78½	44½	Keffi Tin*	23	10	139½	—
Lower Perak	120½	9	931	964½	London Nig.	23	9	218½	—
Malaysiam	10½	10	100½	55½	Naraguta Ex.	5½	1	5½	9½
Pahang	220	6	1320	1320	Naraguta K.	15½	1	15½	12
Rahman	44½	7	285½	282	Naraguta T.	16½	1	16½	21½
Rantau	77½	7	425½	567	Naraguta T.*	7	1	7	3
Rawang Conc.	46½	10	598½	613½	Ribon	7	10	104	93
Renang	181½	7	646½	198	Rukuba	1½	10	22½	20½
S. Kinta¶	375½	10	3864½	3733	S. Bukeru	9½	1	9½	7½
Taiping Cons.	55½	1	55½	—	Tinfields of Nig.	1½	10	22½	17
Tambah Tin	21½	1	21½	10½	Tinfields of Nig.*	·64	10	1·22	—
Tanjong Tin	58½	1	58½	72½	U. Tin	8	7	55	86
Tongkan H.	32½	7	278½	409	U. Tin*	0·075	7	1·265	—
NIGERIA					**MISC.**				
Amal. Tin	388	10	3376	3838	Beralt Tin†	199	10	1922	1787
Amal. Tin*	75	10	600	461	Beralt Tin	4	10	74	112
Bisichi	55	1	55	45	Geevor	60	1	60	53
Bisichi*	22	1	22	15	S. Crofty	53½	1	53½	48

* Columbite † Wolfram ‡ Dredge closed 8 days for cleaning § No. 4 dredge resumed January 13. ¶ No. 2 dredge closed 11 days for repairs.

Anglo-French Maintains Dividend

An advance profit statement issued by the Anglo-French Exploration Company, covering the year ended December 31, 1953, announced a dividend of 7½ per cent (same) equivalent to 1s. 6d. per £1 stock unit on the £800,000 issued capital.

The profit for the year was £82,638 (£79,039) against which there was taxation chargeable of £39,841 (£38,368), and an amount of £9,477 (£8,733) applied in reduction of the book value of its investments leaving a net balance for the year of £33,320 against £31,938 in the preceding year. The net dividend of 7½ per cent absorbed £33,000 (£31,500) leaving the carry forward slightly stronger at £29,868 compared with £29,548 brought in.

Dividend will be paid to all those registered on March 2. The full report and accounts will be posted on March 10. The annual meeting will be held on April 2 and it is intended to post dividend warrants on the same day.

Petaling Tin's Lower Earnings

The preliminary profit statement published by Petaling Tin in respect of the year ended October 31 last shows a decline in the net profit of £137,782 to £281,572. The dividend was cut back by 35 per cent to 70 per cent, equivalent to 1s. 7.6d. per 2s. 4d. share on the issued capital of £513,334.

Year to Oct. 31	Working Profit	Taxation	Net Profit	Dividend Distribution		Carry Forward
	£	£	£	£	%	£
1953	405,939	124,367	281,572	251,534	70	115,961
1952	652,687	233,333	419,354	377,300	105	85,923

The general manager's report states that a lower output must be expected during the current year in view of the temporary loss of production from Nos. 3 and 5 dredges. The report and accounts will be submitted at the annual meeting to be held at Ipoh, Perak, Malaya, March 9.

Company Shorts

Jantar's New Columbite Contract.—Jantar Nigeria has announced that it has concluded a contract to sell its columbite output available for shipment before June 30, 1954 to the U.S. Government, through the Emergency Procurement Service. The agreed price is $1.40 per lb. of combined pentoxides contained in the concentrates, plus a premium of 2 c. per lb. for each additional full per cent of combined pentoxides contained above 35 per cent. This should result, the company states, in its receiving approximately £2,100 per ton of concentrate, including the 100 per cent bonus; providing that the grade of concentrate remains unchanged.

Negotiations for a further contract are being pursued and stockholders will be informed of the results in due course.

New Broken Hill's Issue Over-subscribed.—The issue by New Broken Hill Consolidated of £1,000,000 5½ per cent Unsecured Loan stock, 1956-65, which was placed on the market at 100 per cent, was over-subscribed and an announcement regarding the basis of allotment will be made some time this week.

Kansanshi Encounters Difficulties.—A large watercourse intersected by the main north shaft which has proved impossible to clear, has blocked development work at 300 ft. at the Kansanshi mine in Northern Rhodesia, states the latest progress report covering the six months period ended December 31, 1953. Accordingly, a concrete plug was successfully installed in August and station cutting was begun in the same month with a view to commencing development work at 290 ft.

By this time, however, it was clear that the area contained a number of open fissures linked with a widespread sub-surface drainage system. Increased pumping arrangements were, therefore, put in hand and during the excavation of the pump chamber, a narrow vein was intersected which on sampling averaged 3.94 per cent copper over a width of 11 in.

No water difficulties were experienced in the main south shaft where reclamation work was begun in September. Development work undertaken from this shaft interesected a quartz-carbonate vein which averaged 5.36 per cent copper over a true width of 4 ft. and graphitic shale averaging 3.04 per cent copper over 6 ft.

Check sampling of the remaining accessible old workings was completed in August and broadly confirmed the widths and copper values revealed by previous sampling. On the other hand, gold assays of check samples have been somewhat less than previous reports suggested.

The diamond drilling programme has also encountered difficulties. Hole H reached 1,115 ft. by the end of last year "without intersecting anything that could be identified as an extension of the vein being sought." It is intended to continue drilling to a final depth of 1,300 ft.

Hole J, 620 ft. north of hole G which yielded the good copper values announced last September, struck ground which was soft and full of cavities to the top of the limestone at about 300 ft. Three attempts have been made to set casing through this ground without success and a pilot hole drilled to the limestone had still to be reamed to full size and cased at the end of the year.

English Electric's Higher Group Profit.—A preliminary profit statement issued by the English Electric Company giving its financial results for the year ended December 26, 1953, announced a final dividend of 6¾ per cent, or 1s. 4d. per £1 stock

unit on the £10,616,193 ordinary issued capital. The payment now recommended will require a net £389,260 and compares with £278,675 absorbed a year ago when 10 per cent final was paid on an issued capital of £5,308,097.

Group profits, after all charges other than taxation, expanded by £420,886 to £4,779,920. After providing £3,226,023 (£2,909,516) for taxation, the group net balance for the year was £104,379 higher at £1,553,897, of which £1,546,995 (£1,383,057) was attributable to the parent company.

The report and accounts and notices of the meeting will be issued on February 22. The final dividend will be paid on March 18 to those registered on February 17. Sir George Nelson is chairman. Meeting, London, March 17.

New Bushtick Agreement.—Bushtick Mines (1934) have announced that a compromise has been reached, subject to approval by the Court, under which shareholders who do not wish to retain their interest in the company may surrender their shares to the company which will pay for them at 3s. 3d. per share.

The company will not be wound up, but will carry on such business as may be decided upon by a new board who will assume office when the Compromise Order becomes effective.

It will be the policy of the new board, which consists of Mr. B. T. Getz, Mr. C. D. C. Geyer and Mr. H. R. H. Hahn, to investigate various gold and uranium propositions they have under consideration in the Union of South Africa and in Rhodesia.

It is estimated that the sum of 3s. 3d. per share represents the amount shareholders would receive if the company went into liquidation.

NATIONAL COAL BOARD invite applications, preferably from young qualified mining engineers, for a superannuable post of Assistant Mechanization Engineer in the Mechanization Branch of Production Department at London Headquarters. The successful candidate will work under the direction of one of the Headquarter's Mechanization Engineers and will be given the opportunity of becoming proficient in the installation, use and maintenance of modern types of power loading equipment with a view to helping collieries to install and operate such equipment for the first time. Ability to write reports and to prepare Information Bulletins and similar publications will be necessary.

Preference will be given to candidate with considerable coal face experience of at least one modern type of power loading equipment. Knowledge and experience of mechanical and/or electrical maintenance will be an advantage.

The occupant of the post will be stationed in London in the first instance, but may subsequently be moved to the Board's Central Engineering Establishment in South Derbyshire. He will be required to travel extensively in all British coalfields and occasionally overseas. Salary according to experience and qualifications in the range £1,000 to £1,750 per annum, inclusive.

Write, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates) to National Coal Board, Establishments (Personnel), Hobart House, Grosvenor Place, London, S.W.1, marking envelope TT/741. Closing date March 8, 1954. Original testimonials should *not* be forwarded.

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Directors' Report for the Quarter ended December 31, 1953

The following is the Report on the work done during the quarter ended December 31, 1953.

Tons crushed **15,184**
Estimated Profit from Antimony and Gold **£70,433**

Sales of Antimony were effected during the quarter.

Taxation for the twelve months ended December 31, 1953, in respect of total profits for this period amounting to **£283,785**, is estimated at **£68,250** of which **£5,250** represents Loan Levy.

Revenue of **£97** in addition to the above was received during the quarter from sales of gold for manufacturing purposes.

The Capital Expenditure less recoupments during the period amounted to **£1,193**.

During the quarter the development footage accomplished amounted to **220** feet.

The whole of this footage was accomplished in a lens known to carry gold values only. **210** feet were sampled and proved to be unpayable, giving an average value of **5** dwt. per ton over a width of **79** inches.

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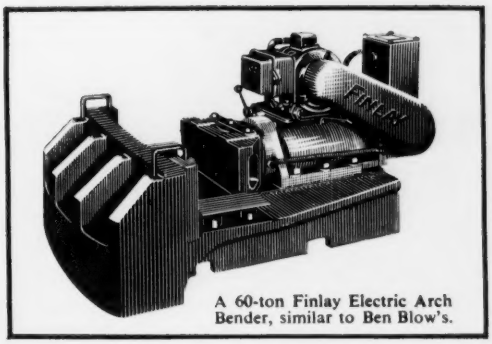

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